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ELECTRICAL WEST

July 1956
25 Cents

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U. S.

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Edison is demonstrating the speed of electric cooking . . . to speed up your electric range sales.

Now! Bacon and Eggs in 3½ minutes when you cook electrically!

TODAY, NOTHING COOKS FASTER than a modern electric range. Bacon and eggs in 3½ minutes. Instant coffee in 60 seconds. Hot soup in 68 seconds. Fry, bake, broil or roast – electricity does it better.

There's more: your kitchen is as much as 16° cooler. And cleaner. Pots and pans stay mirror-bright. Kitchen walls look fresh and new twice as long – when you cook the modern way.

Someday you'll cook on a modern electric range. It's almost inevitable. But why postpone it? Happily – in addition to being fastest, coolest and cleanest – electric cooking is also *economical*. Edison rates are among the lowest in the country. What's more, Edison services your range *free* as long as you own it. (The only charge is for parts, when needed.)

If you're still cooking the old way, it's simply because you haven't seen the new '56 electric ranges at your appliance dealer. Visit him and *Live Better – Electrically!*

Southern California Edison Company

see the man from Smoot-Holman first!...

...for the best in school, commercial and industrial lighting

No matter how difficult the illumination problem — the Smoot-Holman lighting expert is the **man to see!** Here is trained "know-how" backed by Smoot-Holman's modern plant facilities and quality lighting equipment.

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SMOOT-HOLMAN

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INGLEWOOD, CALIFORNIA

We support the National Lighting Bureau

service in the west and southwest for all school, commercial and industrial lighting

ELECTRICAL WEST

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U. S.

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Next Month

California's $8.6 billion water plan will be the subject of the leading article. Engineering articles will include: reconductoring of PG and E's 220-kv Pit lines; new approach to residential underground; pressure testing of underground equipment; load frequency control; new approach to emergency lighting.

ELECTRICAL WEST (with which is consolidated The Journal of Electricity). JULY 1956. Vol. 117, No. 1. Published monthly by McGraw-Hill Company of California. **Executive, Editorial and Advertising Offices: 68 Post St., San Francisco 4, Calif.** Publication office: 1125 W. Sixth St., Los Angeles 17, Calif. James H. McGraw (1860-1948), Founder; Donald C. McGraw, Chairman of the Board; George C. Tenney, President; John W. Otterson, Vice President; B. M. Boccali, Secretary and Treasurer. **Subscriptions: Address correspondence to Electrical West—Subscription Service, 68 Post St., San Francisco 4, Calif. Allow 30 days for change of address. Please indicate position and company connection on all subscription orders.** Single copies 25c. Subscription rates—U. S. possessions and Latin American Republics: $2 a year; $3 for two years; $4 for three years. Canada $2.50 a year; $5 for three years. All other countries $3 a year; $5 for two years; $6 for three years. Entered as second class matter April 17, 1947, at the post office at Los Angeles, Calif., under the act of March 3, 1879. Printed in U. S. A.

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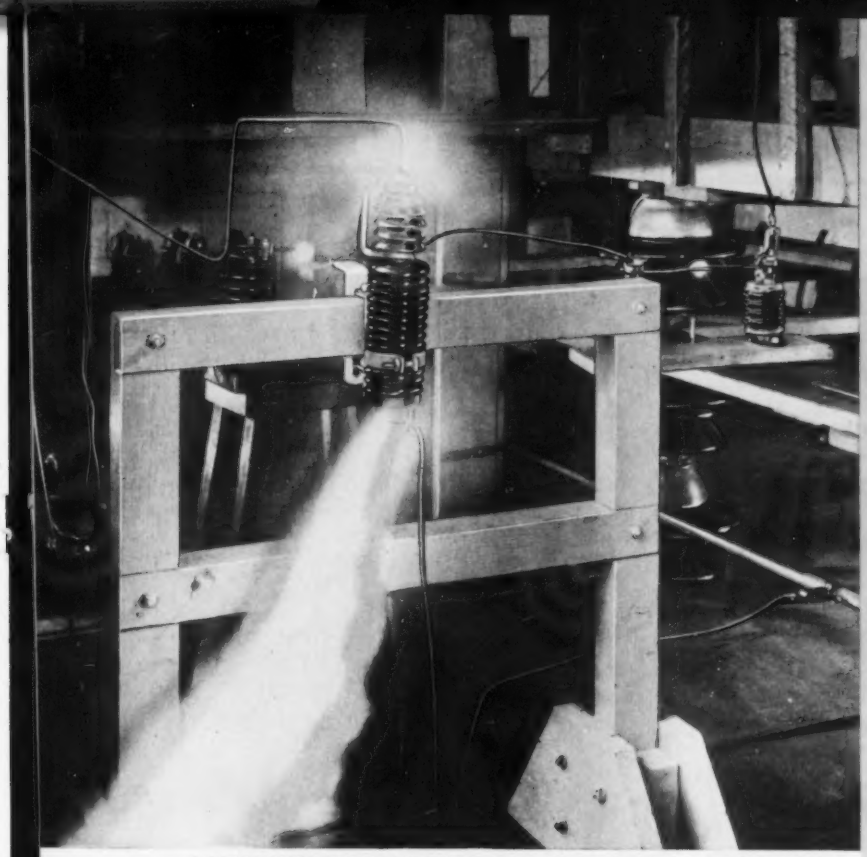
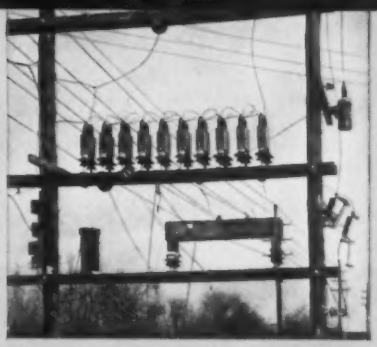


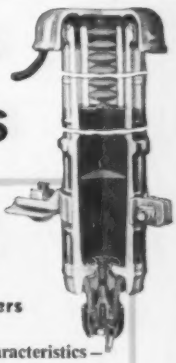
A LARGE NUMBER OF BLOWN FUSES WERE TRACED TO EXPULSION ARRESTERS. Photo shows one of the tests conducted by L-M engineers with the utility engineers that placed responsibility for the outages on the expulsion arresters.



EXTENSIVE FIELD TESTS were made by one utility to prove that expulsion arresters were satisfactory. But the evidence was the other way; the company continues to use valve arresters exclusively.

MANY COMPANIES ARE SWITCHING TO VALVE ARRESTERS because valve arresters provide a higher degree of protection. One company not only switched to valve type, but replaced every expulsion arrester on the system. Picture above shows lineman replacing an expulsion arrester with a valve arrester.

Why Valve Type Lightning Arresters Are Better Than Expulsion Arresters



By **GEORGE W. COOPER**
Product Manager
Protective and Power
Switching Equipment
Line Material Company

Line Material is frequently asked, "Which arrester principle is best for my system?" The answer is provided by operating companies who have tested and proved through field experience that *valve arresters are better than expulsion arresters.*

Regardless of differences in design by various manufacturers, there are certain basic differences in the valve *principle*, as compared with the expulsion principle.

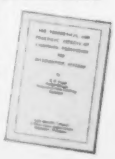
The valve arrester operates on the principle of a valve, which "opens," with low resistance to high-voltage, high-current lightning surges, and "closes," with high resistance to 60-cycle follow current.

The expulsion arrester operates on the pressure principle, of expelling the power follow current arc. For this purpose fibre is used to form the gases which expel the arc. This fibre is subject to erosion—and changing characteristics. These limitations apply regardless of differences in design, manufacture, etc.

Listed at the right are four principal reasons why we recommend valve type arresters over expulsion arresters.

Get Complete Information

Details of some of the extensive evidence in favor of valve over expulsion arresters are given in a new booklet, "The Theoretical and Practical Aspects of Lightning Protection for Distribution Systems." Whichever type you use, we believe you'll be interested in this report. Ask your L-M Field Engineer for a copy, or write Line Material Company, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.



FOUR REASONS for recommending valve over expulsion type arresters

1. Better Protective Characteristics—The valve arrester sparks over more quickly and at lower voltages on lightning surges.

2. Unlimited 60-Cycle Capacity—The application of the valve arrester is not limited by the available short-circuit current.

3. No Fuse Coordination Problems—The valve arrester will pass relatively small values of 60-cycle follow current, regardless of system capacity.

4. Longer Life—The valve arrester is electrically and mechanically unaffected in handling lightning discharges usually encountered in service. Its life is relatively unlimited.

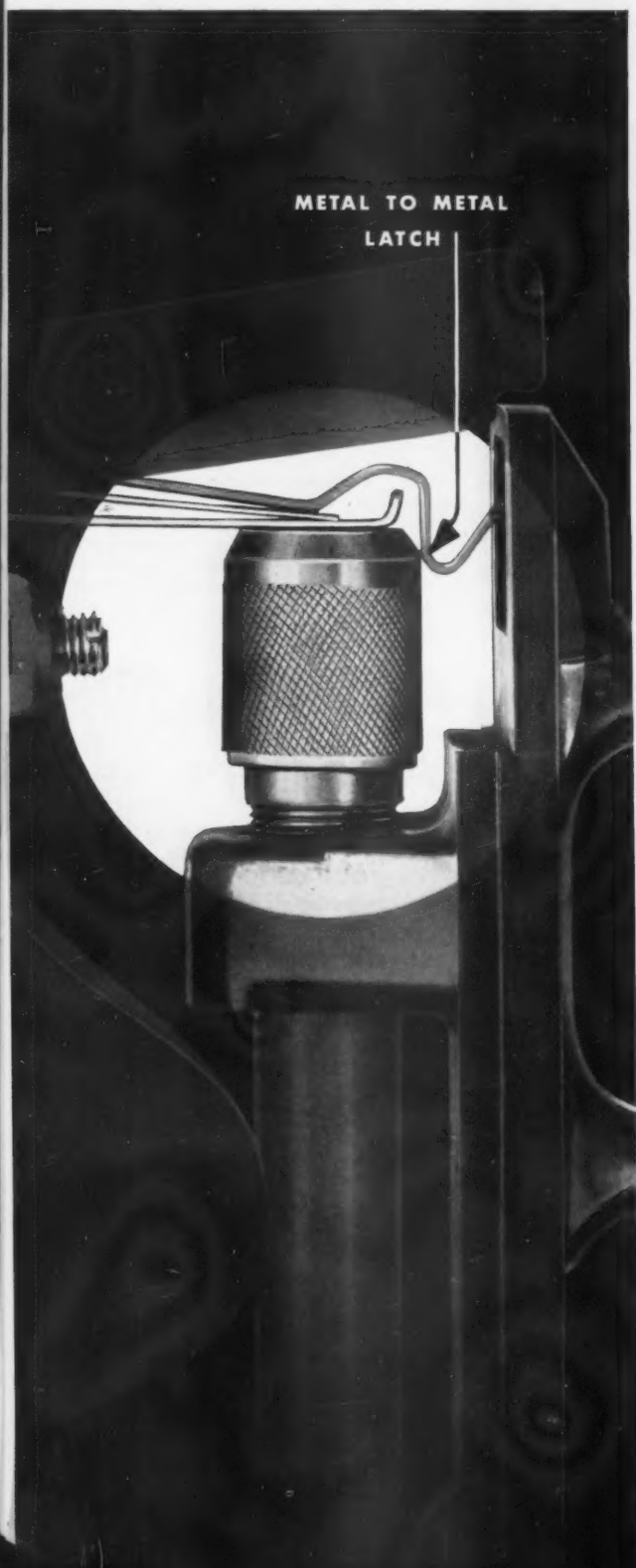
259

LINE MATERIAL Lightning Arresters

A McGRAW ELECTRIC COMPANY DIVISION

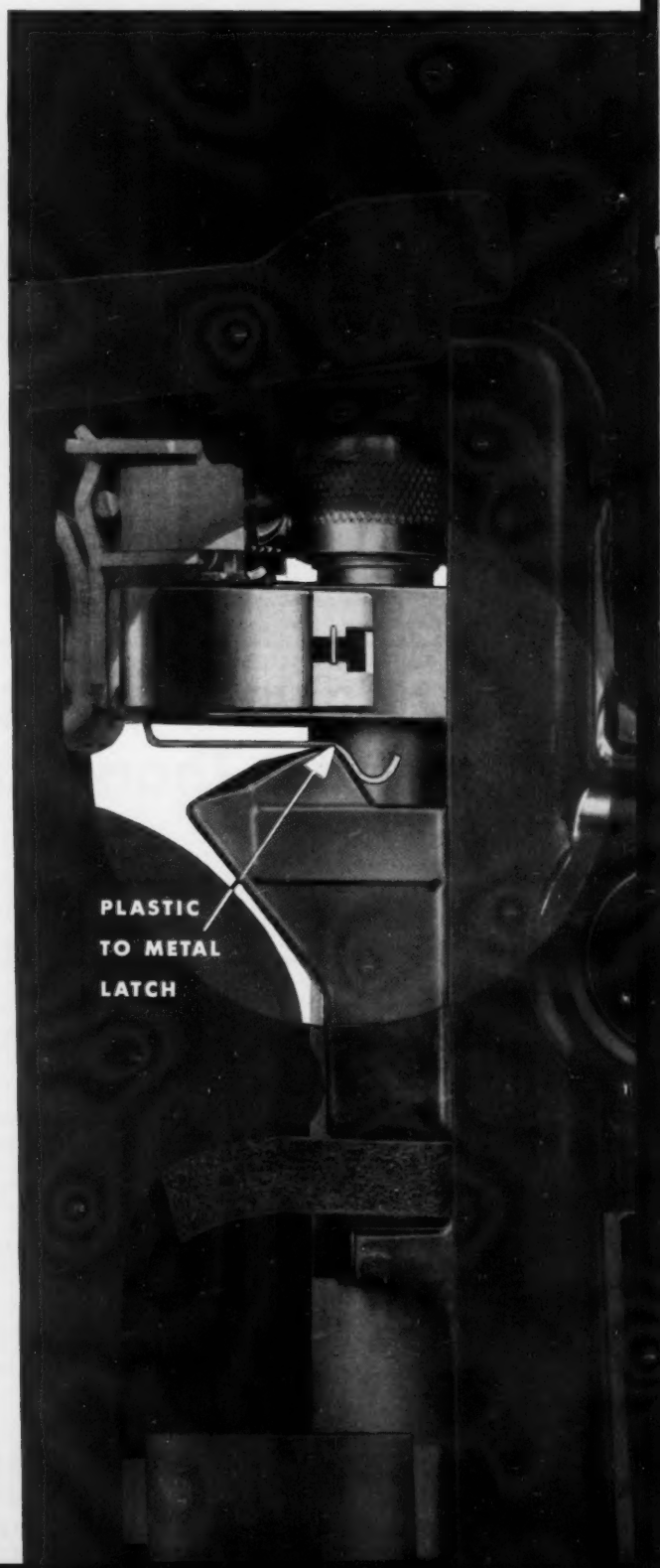
old

Metal-to-metal latching sometimes "seizes" under corrosive conditions. Door may be hard to open.



new

Plastic-to-metal latching eliminates door "seizing" problem. Door opens quicker, easier.



ALL-NEW ENCLOSED FUSE CUTOUTS

now...

Plastic-to-metal door latch assures easier opening prevents door "seizing"

Even after years of service, the doors on all-new G-E enclosed fuse cutouts open easier. Unique plastic-to-metal latching prevents corrosive "seizing" common to metal-to-metal latches. Easier door-opening is assured for drop-out action, switchstick handling, and manual operation.

POSITIVE LATCHING is assured throughout the life of the cutout by latching members of sturdy Textolite* material and long-life stainless steel. Current-carrying parts and latching members are functionally separated and are not required to perform a double duty.

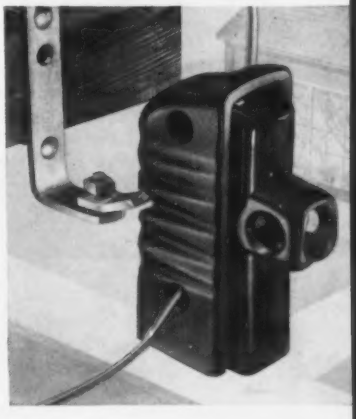
ALL FUNCTIONS IN ONE basic design—G.E.'s new enclosed fuse cutout line gives all functions . . . indicating-dropout, indicating-non-dropout, disconnect—in one basic design. You get two current ratings, 50 and 100 amperes, and two voltage ratings, 5.2 and 7.8 kv, to match every possible system demand.

OTHER OUTSTANDING FEATURES include: the safety-grip door handle, for easier door handling; self-aligning "V"-wedge contacts, that add years to cutout life, and compression-clamped hanger supports, that withstand the roughest shocks. For a complete description of the new cutout line, write for bulletin GEA-6208, General Electric Company, Sec. 433-15, Schenectady 5, N. Y.

*Registered Trademark General Electric Co.

ENGINEERS AND LINEMEN AGREE

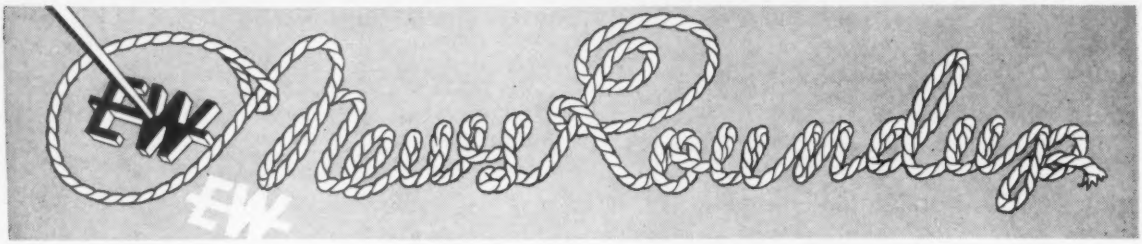
The completely new line of G-E fuse cutouts has more of the features they prefer. There's good reason, too—the new design incorporates suggestions made by utility engineers and linemen to G-E sales engineers and specialists.



Progress Is Our Most Important Product

GENERAL ELECTRIC

With factories in Anaheim, Los Angeles, Oakland, Ontario, San Francisco, San Jose, Seattle, and Richland, and Sales Offices in twenty Western cities.



SIGNIFICANT ITEMS FROM THE EDITORS' NOTEBOOKS

ATTITUDE — Union opposition to some of the large federal power proposals made news last month. The Utility Workers of America (AFL-CIO) firmly opposed the government building and operating additional atomic power reactors as proposed in the Gore Bill.

Other unions condemned the legislation that would authorize the State of New York to build the Niagara additions and the movement by TVA to by-pass Congress in seeking funds for new steam-plant construction.

Practicality and not philosophy seems to dictate the union's attitude. Apparently bargaining with government bodies has been found to be both frustrating and barren.

—EW—

The fuel (U-235) used by Commonwealth Edison's new Dresden nuclear power station will weigh about 500 lb per year in contrast to 500,000 tons of coal that would be required for a conventional steam station of the equivalent output. One of the big savings in the station design is the cost of storage and handling facilities for this vast amount of coal.

—EW—

FORECAST — The Edison Electric Institute's electric power survey committee reports that the construction of electric power generating facilities in the U. S. is at an all-time record high.

Last year, the total generating capability placed in commercial operations totaled 12,500,000 kw, bringing the total available capacity in the U. S. to 116,000,000 kw. By the end of 1959 the country's generating capability will be 154,000,000 kw, an increase of 33% over the 1955 figure. At that time it is estimated that the December peak will be 130,000,000 kw.

New power projects scheduled for completion in 1956 and subsequent years total 36,000,000 kw. The annual power survey is one of the most complete documents of its type compiled.

The Westinghouse Electric Corp. has announced a new type of central air conditioning unit that requires no cooling water and can be installed in less than 18 cu ft. It has a 3-ton capacity and sells for about $900 plus installation cost. Objective: the average home market.

—EW—

VICTORY—Public utilities generally may admit there is a little justice in the world after all. The billion-dollar highway program now well on its way to final enactment in Congress provides that the federal government will reimburse utilities for relocation costs.

Such payments would be applicable in any state that provides for reimbursement under the state law. The federal government's share of the reimbursement will be in the same ratio as the federal contribution to the overall project, i.e., 90% for interstate highways and 50% for other federal-aid roads.

—EW—

NEED MONEY?—U. S. industry will require $60 billion worth of new equity money during the next 10 years, according to Keith Funston, president of the New York Stock Exchange. With this investment it is expected that industry will raise the gross national product to a value of $535 billion annually.

Sources of these funds are expected to be in the institutional investor (up to $2 billion annually) and the general public (from $1 to $3 billion annually). The latter figure is considerably more than the amount received from the general public at the present time.

—EW—

COLOR CLOSER — RCA has announced a 21-in. color television for a price of $495. It is a table model with a 23-tube chassis.

The price of under $500 has been a goal of the set makers and theoretically marks the milestone where color TV sets move into the mass market.

SOLAR SHINGLES—We quote H. Leslie Hoffman, president, Hoffman Electronics: "The break-throughs that have occurred recently would indicate that the science fiction idea of having solar-cell shingles on the roof of a house to supply light and power for an entire family can no longer be considered visionary."

The occasion for the foregoing comment was the demonstration of a new silicon solar battery which makes it possible to capture 10% of the sun's energy—a whopping jump in efficiency from previous similar devices.

Despite this, experts seem to concur that it will be some time before the distribution transformer becomes technically obsolete.

—EW—

ADVANCE NOTICE — Merle Skinner, chairman of the National Electrical Week committee, announces the dates of Feb. 10-16, 1957, as the time for celebrating this all-industry event.

Also contemplated is a second closed-circuit TV telecast built around the theme of Live Better . . . *Electrically* which will be presented in advance of the week in time to help generate greater interest in the event.

—EW—

HIGHEST HONOR—Washington Water Power Co. will not mind if all of us in the Western electric utility industry take a bit of pride in the fact that WWP has earned the Charles A. Coffin award.

Heartiest congratulations to Kinsey M. Robinson and the WWP employees for this achievement. This is the third time the company has received the award.

And a special word of congratulation to President Robinson. This is his fourth time up. He received the award for Idaho Power Co. when he was president there in 1936.

Judges praised the company "for winning and holding, in the face of powerful opposition, the friendship and good will of its customers and other

IT PAYS TO HAVE HUBBELL GOOD CONNECTIONS

NEW INSULPRENE

OIL RESISTANT • WATER RESISTANT • IMPACT RESISTANT

Twist-Lock®

Strongest, toughest, most wear-resistant Rubber Connector ever produced.

CAT. NO. **9966**
3 WIRE

20 Amp. 250 Volts (AC or DC)
10 Amp. 600 Volts (AC only)

This new series of rubber Twist-Lock Connector Bodies is molded from an exceptionally tough neoprene composition prepared especially for Hubbell. Because of its excellent insulating properties and outdoor aging characteristics, this new material has been named Hubbell **Insulprene.** It has a high impact resistance enabling it to stand up under the roughest abuse and, in addition, it resists oil, hot water, live steam, grease, fatty acids.

Insulprene Twist-Lock Units, available in 2-wire, 3-wire and 4-wire sizes, are among the safest, most secure and long-lived Twist-Lock Connectors ever produced. Designed to withstand rough industrial or commercial service, they are ideally suited for welding shops, paint-spray rooms, heat-treating departments, bakeries, laundries, car-wash establishments, drive-in theatres.

IT'S RUGGED!

1. A tough fibre disc has been molded into the INSULPRENE ⅛" from the face to insure positive polarity and anchor the blades securely in position, thus preventing accidental pull-out.

2. Blade slots in the disc, accurately die-stamped, prevent incorrect insertion of blades even when extreme pressure is applied.

3. #8 screws with extra large heads simplify wiring and provide a secure connection.

4. Fibre retaining piece anchors terminal plates and seals off wiring area from lint and dust.

5. Powerful Hubbell cord grips eliminate tension from the terminals.

6. Extra rugged terminal plates of ¼" brass.

7. Double wire lugs on each terminal plate effectively confine wire strands.

8. Will accommodate same caps used with regular Twist-Lock units.

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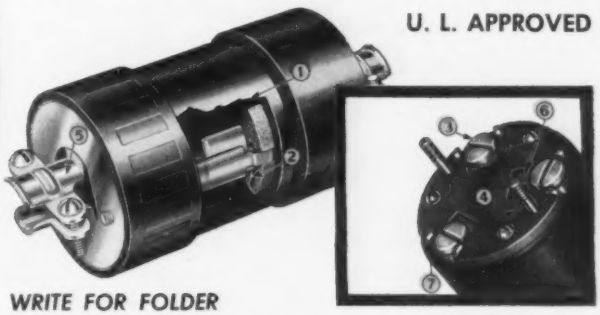

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DEPT. R-1

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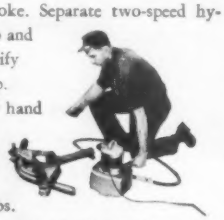
full 90° bend with one stroke of the ram . . . easy portability . . . extra versatility

Here's the kind of real portability you've been looking for in a bender for ½" to 2" pipe and conduit. Using light, but strong, aluminum alloy for many parts, the new GREENLEE No. 880 Hydraulic Bender is unusually *lightweight*, yet extra rugged, fast, powerful . . . produces 15 tons of ram force! One man can easily carry and operate it to quickly make uniform bends. Complete 90° bends can be made with one ram stroke. Separate two-speed hydraulic hand pump and bending ram simplify handling and setup. Easily operated by hand or may be teamed with a GREENLEE Power Pump for fast production jobs.



Attachments also available for bending thin-wall conduit, tubing, bus-bars. Get complete details on how to speed jobs and get better results with the new GREENLEE No. 880 Bender. Write for Bulletin E-217.

GREENLEE

GREENLEE TOOL CO.
1767 Columbia Ave., Rockford, Illinois

people of its area as dramatically illustrated by an overwhelming vote in favor of private ownership in Stevens County, Wash."

We praise them, too, for this achievement.

—EW—

PARTNERSHIP is a word we've heard a lot in the electrical industry for the past few years. In fact, the word has almost come to mean partnership with the federal government.

But on the Stanislaus River in California partnership means local development of resources by local interests, and they have proof the concept can work. The Oakdale and South San Joaquin Irrigation Districts are building three dams because they need more water storage. They were able to finance the project because Pacific Gas and Electric Co. was willing to contract for power from the Tri-Dam project for the next 45 years.

What's more, the same trio has cooperated on the same river since 1927 when the districts built Melones Dam and PG and E built a power house and paid for falling water. There's more on p 123.

—EW—

No bail will be necessary for Portland General Electric Co. officers for the time being. An Oregon grand jury gave them a clean bill of health when Oregon Attorney General Robert Thornton tried to get an indictment for starting Pelton Dam. But District Attorney Warren Albright of Jefferson County is hiding in the bushes watching until PGE starts work on a reregulating dam on private land outside the public domain of Pelton proper.

—EW—

SAVIORS—Senators Robert S. Kerr (D-Okla.) and Warren G. Magnuson (D-Wash.) are going to champion the cause of the American people. In the words of Kerr, "We are going to authorize federal construction of a high dam in Hells Canyon and knock the Idaho Power Co.'s three-dam project into a cocked hat.

"When this bill is passed by the Senate, the Idaho Power Co. should recognize it has a red flag to halt any further work on the Snake River. If the company doesn't, it will find it will be spinning its wheels instead of turbines."

In other words, the esteemed senators are making a political football out of a much-needed power development. It will be interesting to see which gets drop-kicked, the project or the senators.

Incidentally, Sen. Russell Long (D-Ala.) who has held out against the high Hells Canyon bill, might be transferred from the Senate Interior Committee to the Foreign Relations Committee. It figures that his successor will favor the high dam.

—EW—

Colorado has a new G&T cooperative. Tri-State Generation and Transmission Assn. has been formed at Sterling to serve the power needs of 24 rural electric distribution systems in Colorado, Nebraska and Wyoming. Initial loan is for $9,968,000.

—EW—

AWARD—R. A. Work, head of the U. S. Soil Conservation Service's snow survey program in the West, has received the Department of Agriculture's Superior Service Award from Secretary Ezra Benson.

This was in recognition of service rendered in developing a forecasting service that provides advance information on probable water supply for irrigation, hydro generation and other purposes.

The forecast is published each year in the May issue of ELECTRICAL WEST.

—EW—

Blacklight is being used for highway signs in California. White letters on a black background in the daytime appear to be slightly green letters with no background at night. The letter-to-background brightness ratio is 200 to 1, about four times better than the conventional signs lighted by slimline fluorescent tubes. The new sign consists of the standard porcelain-enameled sign panel with fluorescent grits on the white letters and then another porcelain-enamel coating over the grits.

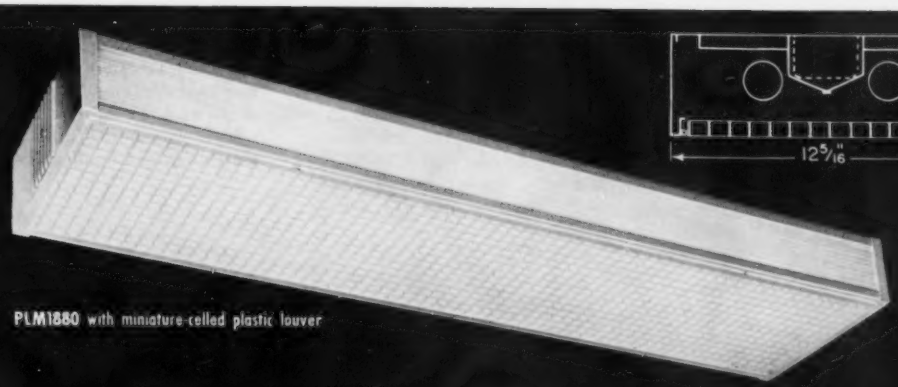
—EW—

SHORTAGE — Hydroelectric plants of the Pacific Northwest will fail to meet demands for power next winter, according to Miller Evans, deputy operation director of Bonneville Power Administration.

BPA's estimate is that the shortage will be about 235,000 kw.

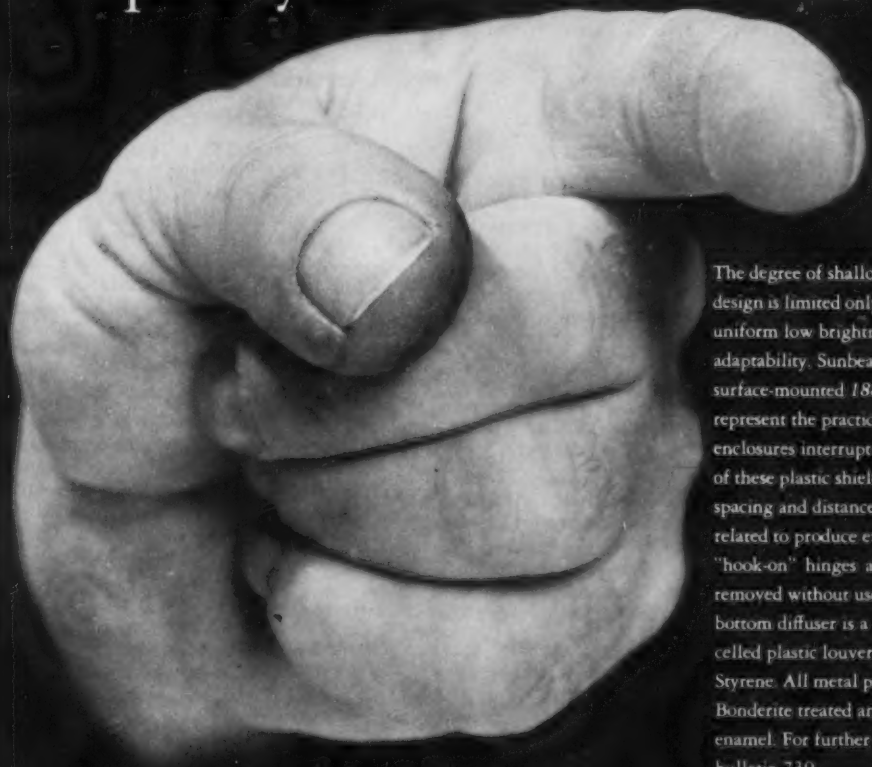
Explanation is that power demands are increasing faster than expected and generator installations at Chief Joseph Dam are behind schedule because of the Westinghouse strike.

(Roundup continued, p 10)



PLM1880 with miniature-celled plastic louver

a point you can't afford to miss



The degree of shallowness in lighting fixture design is limited only by how much you demand uniform low brightness and architectural adaptability. Sunbeam's new, extra-shallow surface-mounted *1880 series Visionaires* represent the practical limit. No exposed ballast enclosures interrupt the smooth appearance of these plastic shielded luminaires. The lamp spacing and distance to diffusers are exactly related to produce even brightness. Unique "hook-on" hinges allow bottom panel to be removed without use of tools. Fully framed bottom diffuser is a single-element miniature-celled plastic louver or ribbed, translucent Styrene. All metal parts are corrosion resistant Bonderite treated and finished in baked white enamel. For further details, please ask for bulletin 739.

P1880 with ribbed translucent plastic

SUNBEAM visionaire

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OTHER PLANTS: GRIFFIN, GA.; PHOENIX, ARIZONA; BRANTFORD, ONTARIO
To: J. H. Holan Corporation 4100 West 150th Street Cleveland 11, Ohio
Please send me the factual technical bulletin about Holan's 4401-H Portable Hydraulic Earth Borer.
Name Title
Address Zone State
City

Adequate tree control around utility distribution and service lines is too often in the same category with slamming a swinging door—they always come back. Next month we're going to tell you about Portland General Electric's experiment. They are buying *the* right kind *of trees for a new subdivision.*

—EW—

ONE THOUSAND multimillion-kva circuit breakers 115 kv and over is a lot of production. That is how many Pacific Electric Switchgear Division of Federal Pacific Electric Co. has manufactured.

The event was celebrated June 28 in San Francisco when Pacific Switchgear delivered the 1,000th unit to Pacific Gas and Electric Co. in a ceremony at the plant there.

—EW—

The outstanding career of Frank A. Poor, founder and vice-president of Sylvania Electric Products Inc., came to an end June 17 when he died at the age of 76. He formed Sylvania's first predecessor company in Middleton, Mass., in 1901.

—EW—

Last month when the Roundup was being put together, it looked as if Cowlitz County, Wash., PUD and Pacific Power & Light would find a way to compromise on the Lewis River development. In the news section this month you'll see where Cowlitz PUD is going to apply to FPC for the site.

—EW—

CONTROL—Supervisory control systems provided the dispatcher with all the necessary information and control for operation of a large system with a reliability factor of 99% and at a cost much lower than for manual operation —*G. F. Green, B. C. Engineering Co.*

—EW—

INTERFERENCE—Federal Communication Commission rules effective Feb. 1, 1956, put real teeth into commission jurisdiction over radio and television interference.

The offender is subject to a "cease and desist" order pending removal of interference.

Utilities should inform themselves of the full significance and implications of the rules under Docket 9,288 of Part 15 of FCC regulations.

The Atomic Industrial Forum Inc. and the Denver Research Institute are joint sponsors of a national conference called "Uranium and the Atomic Industry," which was held June 25-26 in Denver's Cosmopolitan Hotel.

—EW—

Our pal Ole Svensen, reading the riot act to an argumentive lineman in his crew, was heard to say: "Whaddaya mean there's no reason for it? It's company policy, ain't it?"

—EW—

DRAGON HUNTERS looking for political issues in the flood control aspects of a high Hells Canyon Dam vs three lower dams have had some disappointments from the Corps of Engineers.

Brig. Gen. L. H. Foote firmly testified that the corps does not believe a high dam is essential. Here is the question and his answer:

Q—Of the two alternatives, the 2,600,000 acre-ft at high Hells Canyon, or the 5,200,000 acre-ft at Bruces Eddy, Penny Cliffs, Brownlee and Pleasant Valley, which would be better for control of the big 1894 flood?

A—Assuming that a total of 21,000,000 acre-ft of suitably located flood control storage can be obtained elsewhere in the Columbia basin, a reasonable degree of flood control along the lower Columbia River can be realized without the high Hells Canyon project.

—EW—

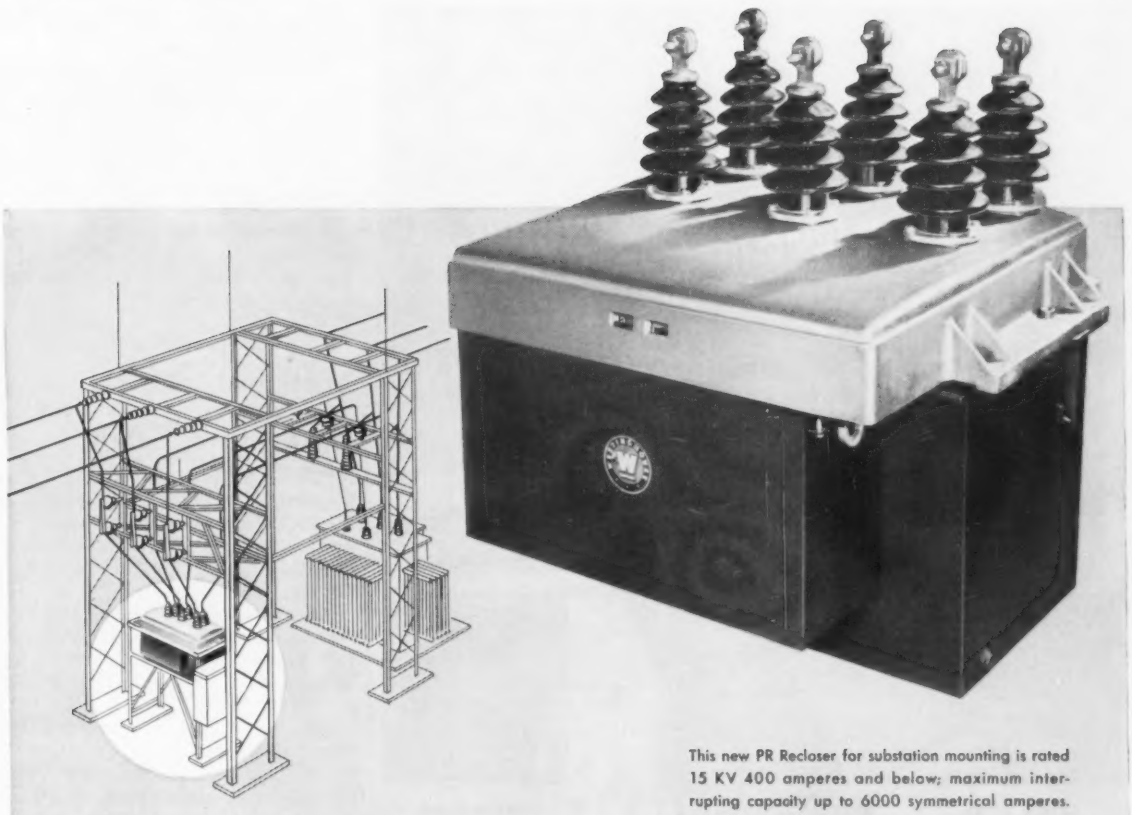
Anderson Brass Works Inc. has had a name charge recently. It is now Anderson Electric Corp. R. E. Schuler, president, has a new, proud title, too. It is "Management Man of the Year," an honor bestowed by the National Association of Foremen Club.

—EW—

FIRST high-frequency lighting job in the West may well be at the University of New Mexico, Albuquerque. It will be similar to that at the Union College Field House, Schenectady.

This system converts the standard 60-cycle, 120-v power supply to 600-v, 400-cycle for the high frequency operation of the fluorescent lamps. Tons of weight are saved because small choke coils and condensers are used instead of ballasts.

Another interesting high-frequency installation just completed was at the Wakefield Co. new office building in



This new PR Recloser for substation mounting is rated 15 KV 400 amperes and below; maximum interrupting capacity up to 6000 symmetrical amperes.

NEW automatic recloser

. . . inexpensive protection for growing substation loads

Here's a packaged bargain for your distribution system in the substation or out on the line.

First of all, the new PR recloser provides 2-3 cycle, high-speed opening, and fast, efficient power restoration. This means, too, much greater protection than ever before against line burn-down. It's all completely automatic . . . real assurance of service continuity on your system.

Second, the package unit is especially built for reduced installation and operating costs . . . shipped frame mounted, wired, tested, ready to be put on the line.

Third, many circuit breaker features are built into the new PR recloser . . . proved condenser bushings, multi-ratio bushing current transformers for ground trip and load indicating metering and other relay functions, dependable motor reclosing, in addition to the time-proved Westinghouse De-ion® interrupters.

Fourth, to ease operating chores, the Westinghouse recloser design provides two separate tanks . . . one, an oil tank, housing the interrupters; the other, a relay and mechanism tank. No scrambling in oil tank with recloser control devices . . . a tank lifter offers easy oil and contact inspection. An accessory cabinet is available with ammeters, control protection and switches . . . demand meters separately trough mounted provide means of load indication and integration.

There's more to the story, so call your Westinghouse representative, or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

J-60890

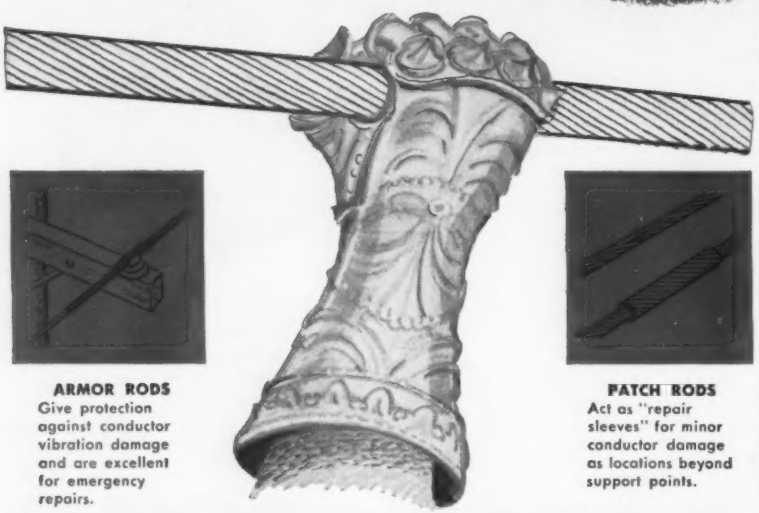
WATCH WESTINGHOUSE!

WHERE **BIG** THINGS ARE HAPPENING **TODAY!**

WHEREVER Protection IS NEEDED
ON OVERHEAD CONDUCTOR LINES

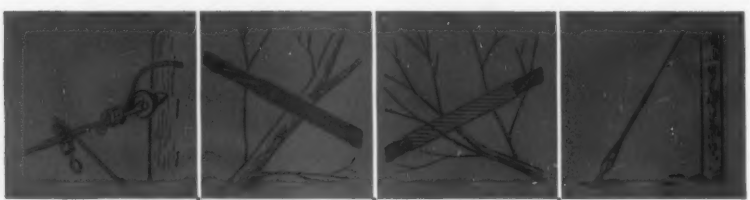
fine FANNER Superformed PRODUCTS

provide it better...easier...at substantial savings



ARMOR RODS
Give protection against conductor vibration damage and are excellent for emergency repairs.

PATCH RODS
Act as "repair sleeves" for minor conductor damage as locations beyond support points.



TAP ARMOR
Protective layer of shortened rods facilitate making taps without risking conductor damage.

PLASTIC FANNGUARDS
Tough, durable plastic sleeves used on covered wires for protection against tree abrasion.

ALUMINUM LINEGUARDS
Made to protect triplex cable or bare conductors against abrasion electrical damage.

FANNGRIPS
For a permanently positive grip on guy strand with maximum economy in material and labor.

Whenever you need accessory items for overhead distribution and transmission lines, you'll do far better by standardizing on Fine FANNER Superformed PRODUCTS. Each product in the FANNER Superformed line is precision manufactured to install easier and faster on the job. Careful packing insures safe delivery and simplified storage. Highest quality materials provide long life regardless of the type of installation. With all their extra features, FANNER Superformed PRODUCTS cost no more than ordinary products.

For full information on the Fine FANNER Superformed Line, write for literature and prices today!

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Fine FANNER Superformed

THE FANNER MANUFACTURING CO.
Electrical Products Division
Brookside Park Established 1894 Cleveland 9, Ohio

AGENTS AND DISTRIBUTORS IN PRINCIPAL CITIES

Vermillion, Ohio, where a 400-v, 840-cycle system was used.

Higher frequencies and voltages are likely to be employed also in control systems such as the IBM carrier current system now used in a North American Aviation plant in southern California. Inspectors will learn about the latter at their fall Southwestern Section meeting in Berkeley.

High frequency is something all parts of the industry will be encountering more and more.

—EW—

ATOM PROGRESS — Eight distinct types of nuclear power reactors will soon be under study in the U. S. Of these, six have already been contracted for and last month the Atomic Energy Commission selected the proposal of the Babcock & Wilcox Co. for the design, fabrication and operation of the seventh type—a liquid metal fueled reactor.

AEC now has selected an eighth type —the gas-cooled reactor for study and will soon invite proposals from firms to participate in the new $4,000,000 project.

The broad scope of the AEC program, which provides for simultaneous research and development work in eight different areas, should speed the final answer as to the best type or types of reactor for use in commercial applications.

—EW—

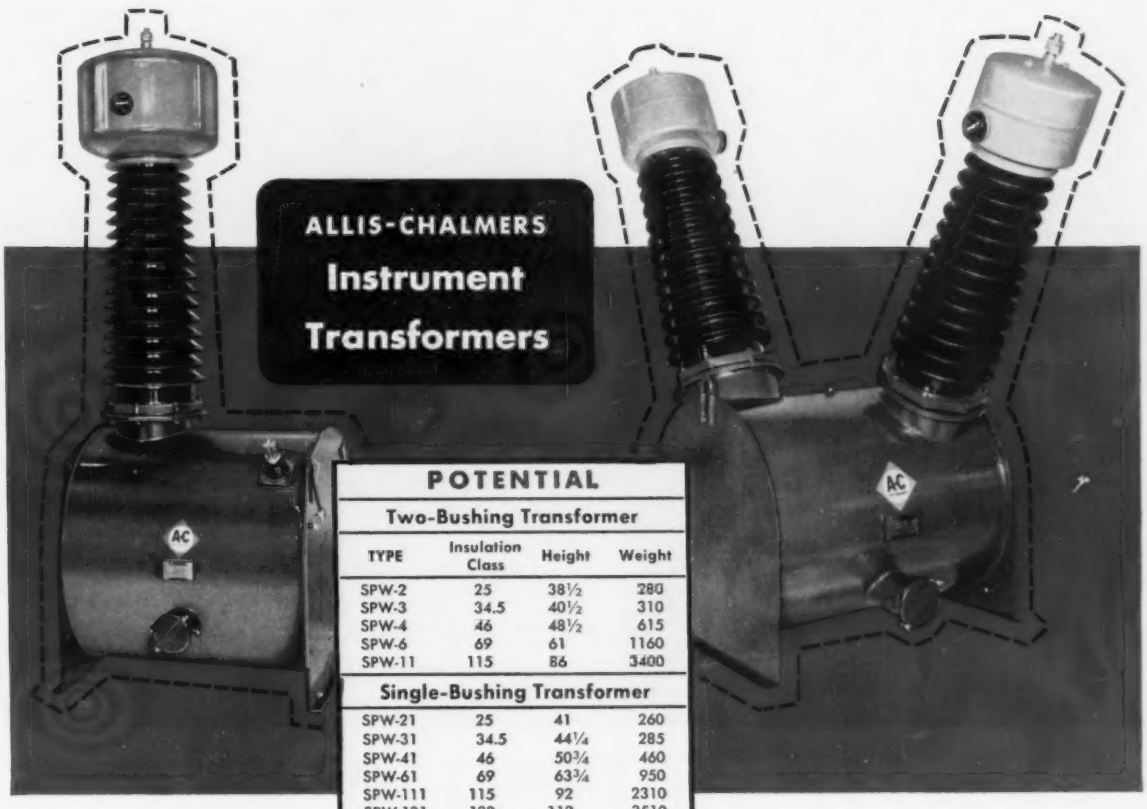
Kennecott Copper Corp. has announced a $40,000,000 program which will extend the life and reduce production costs of its Ray Mines in Arizona. An increase of 20,000 tons of copper per year (about 40% of the 1955 production from the mine) will result from the project.

—EW—

NEW JOBS—C. P. Kennedy, president of the Oklahoma Gas & Electric Co., took over the presidency of the Edison Electric Institute from Harllee Branch, president of the Georgia Power Co.

At the same time Col. H. H. Bennion, managing director, retired amid many expressions of appreciation for his long-time service to the institute and the electric utility industry. Edwin Bernard succeeded Colonel Bennion.

Fred A. Seaton, formerly on President Eisenhower's staff, was confirmed as the new Secretary of the Interior . . . David A. Hamil, speaker of the Colorado House of Representatives, takes over as head of the Rural Electrification Administration.



POTENTIAL			
Two-Bushing Transformer			
TYPE	Insulation Class	Height	Weight
SPW-2	25	38½	280
SPW-3	34.5	40½	310
SPW-4	46	48½	615
SPW-6	69	61	1160
SPW-11	115	86	3400
Single-Bushing Transformer			
SPW-21	25	41	260
SPW-31	34.5	44¼	285
SPW-41	46	50¾	460
SPW-61	69	63¾	950
SPW-111	115	92	2310
SPW-131	138	112	3510

Advanced Design Features Mean...

Savings in Size and Weight

Now, reductions in size and weight make Allis-Chalmers potential transformers easier to handle—simplify installation procedures.

Compact Design results in improved performance in both ratio and phase angle.

New Ratings. This line of potential transformers has also been expanded to include higher voltage insulation classes.

Advanced Corona-Free Design principles enable these transformers to withstand long continued voltage stresses and short-time surge conditions. Internal corners and coil edges are protected by formed insulating channels which fit close to coil surfaces —effectively prohibiting formation of corona and the development of leakage paths.

Maintenance-Cutting Construction Features are incorporated, such as all-welded, hermetically sealed tanks to extend life of coils and insulation. The new one-piece high voltage porcelain bushing incorporates the same corona-free design features that are used in the transformer, thus assuring long trouble-free life.

Get All the Facts on these modern, lightweight transformers. Contact your nearby Allis-Chalmers district office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin, for more information.

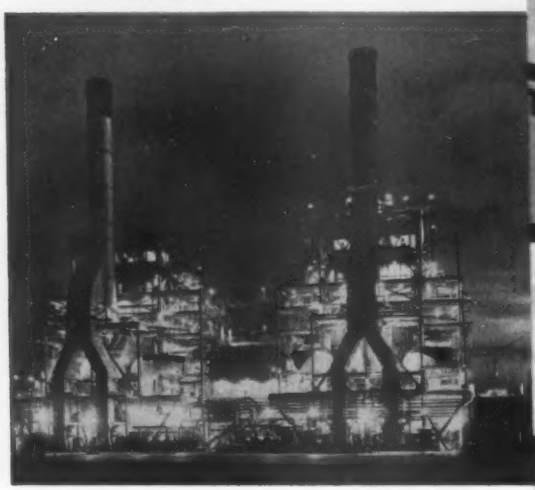
LIVE BETTER ELECTRICALLY

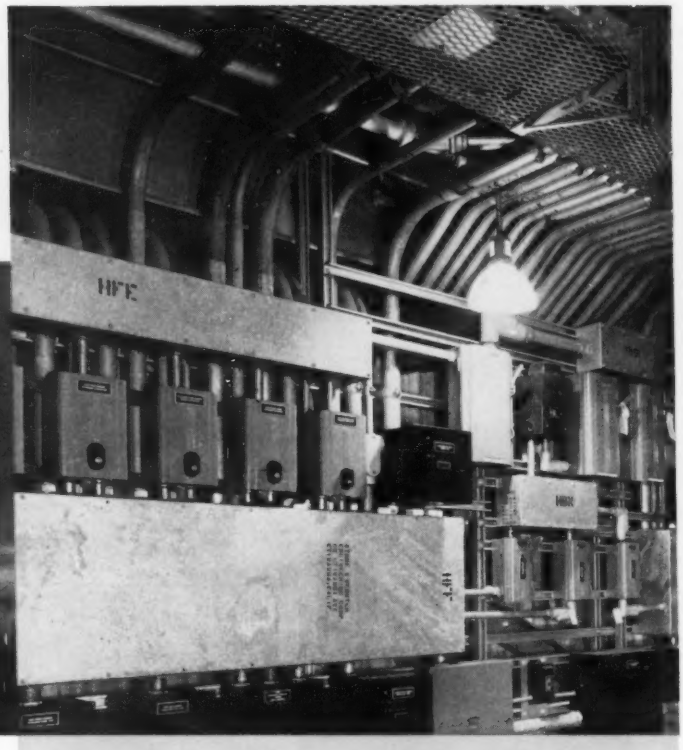
ALLIS-CHALMERS

A-C ALLIS-CHALMERS

A-5087

The ultramodern Etiwanda Steam Station. Capacity 280,000 kw. Open air location of water heaters, steam turbine generators and other equipment speeded building, reduced costs, takes advantage of mild climate.





Many main, branch and feeder circuits at Etiwanda are wired with time-proven dependable RoZone-RoPrene.

ANOTHER MAJOR UTILITY

RoZone-RoPrene for general purpose power circuits...

If you are building a new generating station—expanding present facilities or replacing circuits—Rome Cable has the experience and manufacturing facilities to serve you well.

The Etiwanda Steam Station completed last year by Southern California Edison is a good case in point. To make it the last word in generating efficiency, they considered every component carefully.

For general purpose power circuits, they selected Rome's RoZone-RoPrene.

Long-lived stability

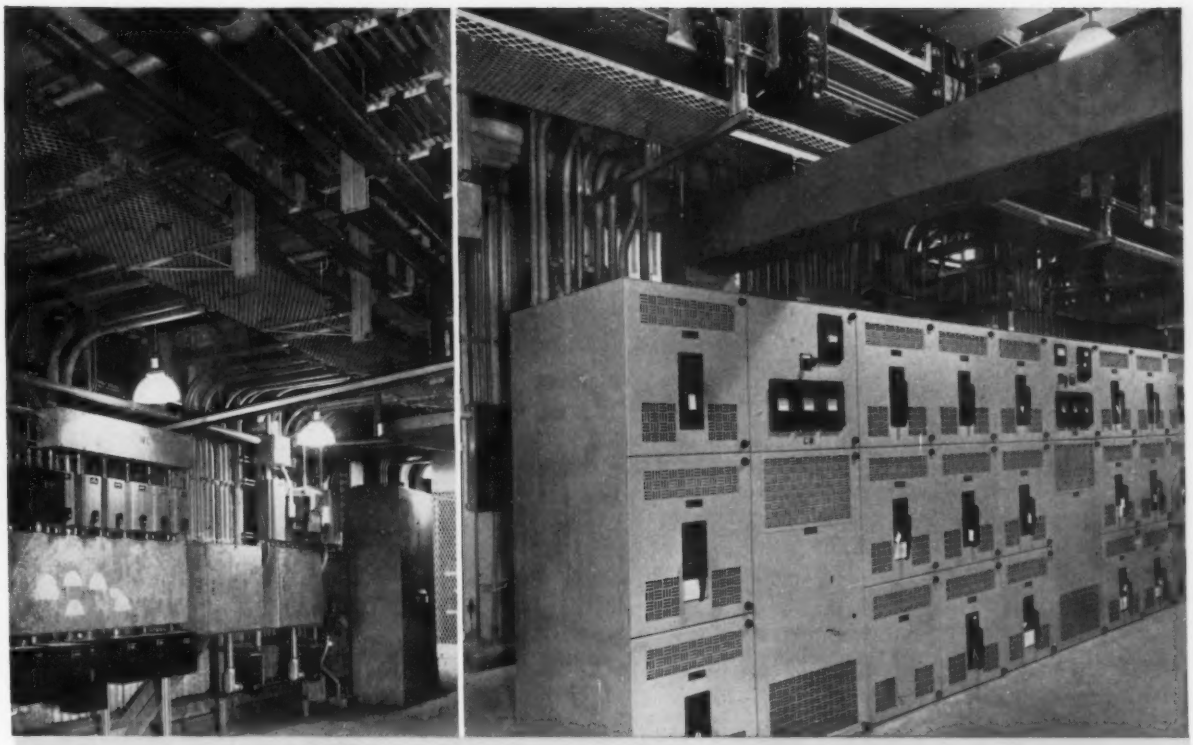
RoZone, a premium quality oil-base compound, has proved its dependability in station after station. It gives you excellent protection against corona and ozone cutting. One of its outstanding properties is unusual resistance to water. This, plus inherent resistance to aging and heat, assures longevity of electrical stability.

Durable protective sheath

RoPrene, a specially compounded Neoprene sheath, provides high resistance to mechanical injury, during and after installation. It resists fire, oils and chemicals. RoPrene possesses superior long-time aging and heat-resistant characteristics. It is lighter and cheaper than lead sheath and immune to corrosion and electrolysis.

The wide acceptance of RoZone-RoPrene by consultants and users, alike, bespeaks its high quality. You can follow their example with confidence.

For conduit they chose Rome • EMT, electrical metallic tubing.



Clean, corrosion-resistant Rome • EMT protects vital power and control cables at Etiwanda Steam Station.

INSTALLATION...

Rome·EMT for cable protection . . .

Easy to install

Rome • EMT combines light weight with speed and ease of installation of compression type fittings. The mirror-smooth inside finish of Rome • EMT makes it easier to "fish" than any other competitive thinwall on the market. Actual tests, involving multiple 90° bends (as many as eight in a single length) have proved this to be true.

High mechanical strength, uniform quality

Rome • EMT is formed from cold rolled carbon steel and electrically welded for maximum strength. Further processing on automatic equipment makes for complete uniformity of quality of its electroplated coating of zinc. The Rome • EMT installed in the Etiwanda Station speaks for itself. It will provide protection for important circuits for many years.

Rome Cable engineers will welcome the opportunity to study your installation problems at any time. Write or phone your nearest Rome Cable office.

It Costs Less to Buy the Best

ROME CABLE Corporation
ROME · NEW YORK
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TORRANCE · CALIFORNIA

WESTERN SALES OFFICES AND WAREHOUSES

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230 South 4th West St.

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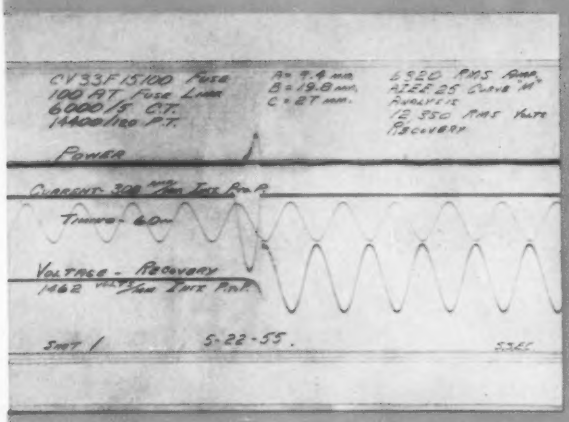
3430 Fourth Ave., So.

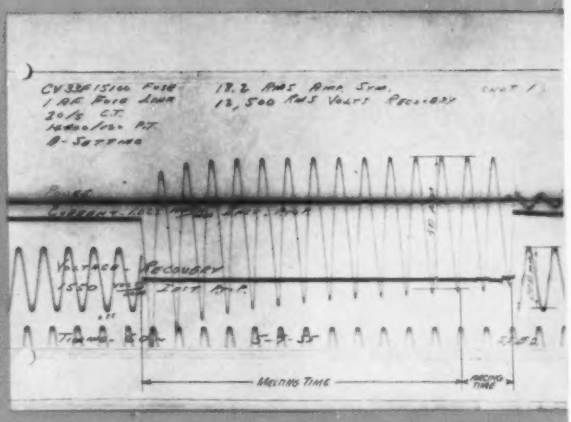
DENVER 3, COLO.
1160 Elati St.

PORTLAND 5, ORE.
1020 S.W. Taylor St.

high faults or low faults



HIGH CURRENT TEST In this test the cutout was subjected to a fault of 6320 amperes at a power factor of 19.6%. Arcing time was less than a half cycle. This test was conducted at Georgia Power Company's North Columbus Substation.



LOW CURRENT TEST In this particular low current test, the cutout was subjected to a fault of 18.2 amperes at a power factor of 15.9%. The circuit was cleared after two cycles of arcing time. This test was conducted at Southern States test facilities.

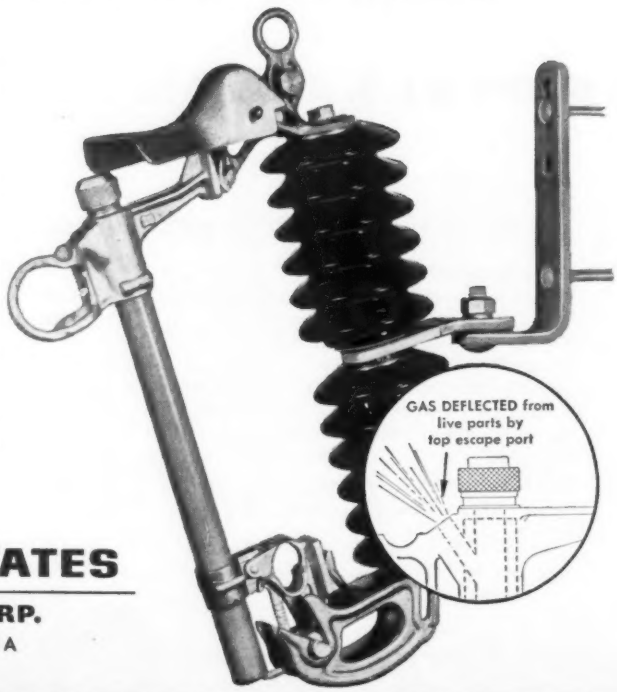
SOUTHERN STATES' CV-33-F TAKES EITHER IN STRIDE

Engineers responsible for system protection often stress the importance of a cutout's ability to clear an overload condition as well as to interrupt maximum faults.

The Southern States Type CV-33-F is designed to give the best possible operation at both extremes.

During its development, Southern States' engineers repeatedly subjected it to both high and low faults. The versatility of the Type CV-33-F Cutout was demonstrated on test after test. Shown above are unretouched photos of oscillograms of two typical tests.

To provide your system with dependable wide-range protection, choose the Southern States Type CV-33-F Cutout.



SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA:
Dominion Cutout Co., Ltd., Toronto

Meet the New Hired Man!

Total farm population has dropped nearly 25 per cent in the past 15 years. Yet farm productivity has increased steadily. One farm worker now produces enough food for himself plus 18 others. Two million of our farmers produce 88 per cent of our farm products.

This increased productivity is possible because electrical servants and mechanical helpers have replaced the hired man on many farms. These electrical servants work a lot cheaper and they don't have to be fed. They milk the cows, cool and handle the milk; cool or heat the pigs, depending on the season; keep the chickens happy with water, feed and comfortable temperatures.

This is only the beginning. Most experts say the average farmer will be using as much as 30,000 kw-hr in ten years, more than ten times as much as he uses today.

Graybar can help you get ready for the increased rural load that's sure to come. Let Graybar serve as your warehouse.

With Graybar serving you, O-B distribution materials will be ready when you need them. Then your customers can put more electrical hired men to work.

OHIO BRASS COMPANY • MANSFIELD, OHIO

Ohio Brass

Distributed by Graybar Electric Company

4673-H

Electric utility growth at low cost is demonstrated

by the Iowa Electric Light & Power Company.

Two 1,000-kw. Electro-Mobile rail units . . . operating either on natural gas or Diesel oil, as circumstances require . . . give them these advantages in extended transmission service:

They boost substation supply through high demand periods.

They take over full local power needs in event of transmission line trouble.

The units, time-clock operated, can be used singly, or in parallel.

A unique maintenance program assures them against obsolescence even in the far future.

ELECTRO-MOTIVE DIVISION

GENERAL MOTORS • La Grange, Illinois

Sold and serviced directly through a manufacturer's organization. Electro-Motive Division offices located in: New York City, Chicago, Jacksonville, St. Louis and San Francisco. In Canada: GENERAL MOTORS DIESEL LIMITED, London, Ontario.

Rail car, truck trailer and portable units— 350 to 1,000 kw.

IOWA ELECTRIC
LIGHT AND POWER
Company
IOWA ELECTRIC
LIGHT AND POWER
COMPANY
NO AIR BRAKES
IOWA ELECTRIC
LIGHT AND POWER
COMPANY

Familiar symbols of safety

FOR YOUR WIRING PROTECTION

Standard-threaded rigid steel conduit is the only wiring system approved today by the National Electrical Code as moisture-, vapor-, dust- and explosion-proof for use in hazardous locations and occupancies.

Permanently safe wiring systems today demand the use of Youngstown Buckeye full-weight rigid steel conduit for positive protection from damaging elements such as water, moisture, vapor, dust and dirt. It's been the accepted standard of architects, contractors and owners who have found over the years its higher quality and longer service life spell increased profits and less trouble on-the-job.

Users across the nation consistently report Buckeye Conduit is easy to fabricate—easy to fish wires through—and guarantees trouble-free installations because of its excellent corrosion resistance.

Leading distributors in every industrial and electrical market are ready to serve you quickly from their ample stocks. They're as near as your phone—why not call now?

Ask your distributor for Youngstown Buckeye Full Weight Rigid Steel Conduit and Youngstown Electrical Metallic Tubing.

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steel

General Offices - Youngstown 1, Ohio
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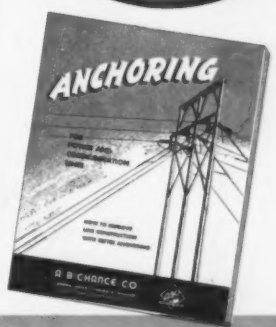
Give the Guy a CHANCE

When anchor users make a study of earth anchors—make their own pull tests for holding power—make their own comparisions... we're happy, because the Chance 8-Way almost always takes top position for holding power and ease of installation.

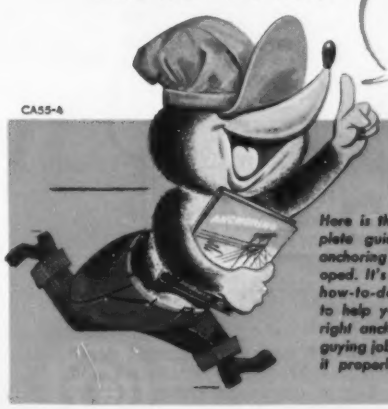
Such tests prove that the 8-Way holds far more than its rated load because its *eight* blades expand to form a complete pyramid shaped square—there is no wasted space between blades. The guy load is distributed to all *eight* blades all the way around the hole.

Chance 8-Way Anchors are available in sizes from 60 to 200 square inches in area, for distribution and transmission line guying. Your Chance Anchor Distributor can supply you from stock. *Specify Chance for Service!*



MIKE THE MOLE SAYS:

Good news for your guys! **Get "Anchoring," the most complete anchor installation guide ever developed... it's FREE. Write today!**



CA55-6

Here is the most complete guide to better anchoring ever developed. It's chock full of how-to-do-it material to help you select the right anchor for every guying job—and install it properly. It's ***FREE!***

A. B. CHANCE CO. • 212 N. ALLEN ST. • CENTRALIA, MO.

O.K. Have "Mike" send us_____copies of "ANCHORING"

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COMPANY_____

ADDRESS_____

CITY & STATE_____

General Electric offers new single-cycle BWR* for atomic power plants

Designed specifically to furnish energy for electric power generation

Forerunner of a whole new family of small power reactors, the General Electric single-cycle boiling water reactor is a new source of energy designed for power plants in a range of 5000 to 20,000 kw. It can be modified for larger ratings.

Boiling in the reactor itself and forced circulation offer these advantages:

(1) Simplified design; no main heat exchanger used. **(2)** High thermal efficiency. **(3)** Automatic control of response to load changes. **(4)** Greater safety since reactor is self-limiting in case of excessive nuclear reactivity.

This reactor uses fuel elements of the long-burnup type. Spent fuel elements are stored in the service pool adjacent to the reactor until cool enough for futher handling.

The reactor and service pool can be equipped for neutron and gamma irradiation for research without interfering with reactor operation.

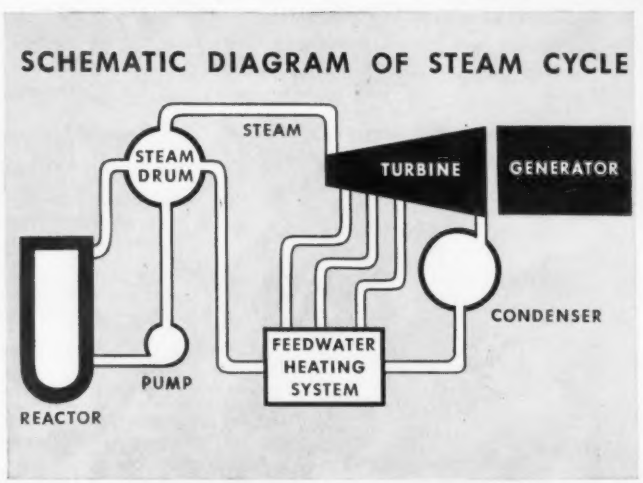
For more information, write for bulletin GER-1220, Sect. 192-7, or contact the Atomic Power Equipment Dept., General Electric Co., Schenectady 5, N. Y.

***Boiling Water Reactor**

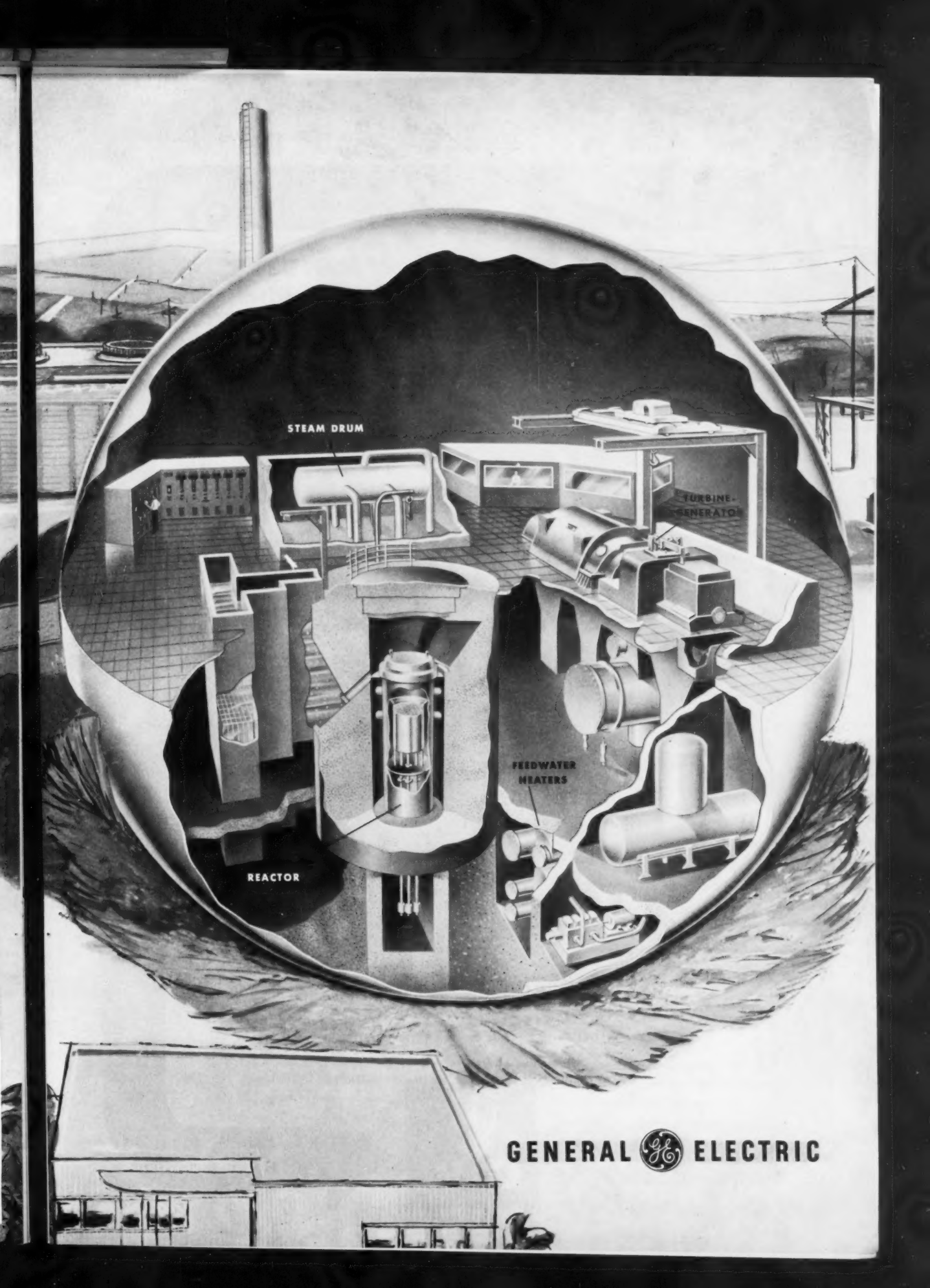
Progress Is Our Most Important Product

GENERAL ELECTRIC

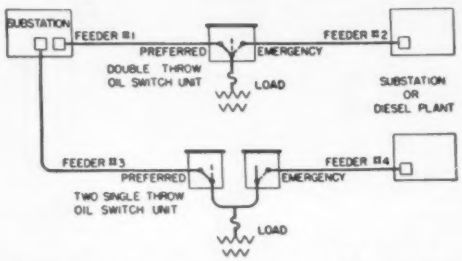
SIMULATED FUEL ELEMENT being installed in a heat transfer loop for tests under reactor thermal conditions. This is one of G.E.'s supporting atomic development programs to advance reactor design.



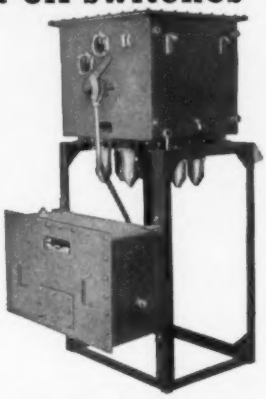
STEAM FLOWS FROM REACTOR to drum. Saturated steam passes to turbine; water goes to feedwater heaters and returns to steam drum. Forced circulation pump provides automatic control of response to load changes.


STEAM DRUM
TURBINE-GENERATOR
FEEDWATER HEATERS
REACTOR
GENERAL ELECTRIC

INSURE SERVICE CONTINUITY
with G&W Automatic transfer oil switches

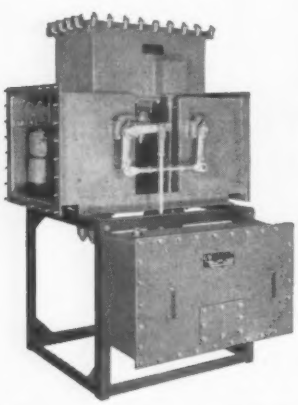


- When preferred feeder voltage fails, the load is automatically transferred to the emergency feeder.
- When preferred feeder voltage is restored (for a period of ¾ minute) the load is automatically returned to the preferred feeder.
- There is no "hunting" on system disturbances. Load cannot be thrown to a "dead" source.
- Model "F6" automatic mechanism provides for remote operator selection of either feeder as the "preferred."

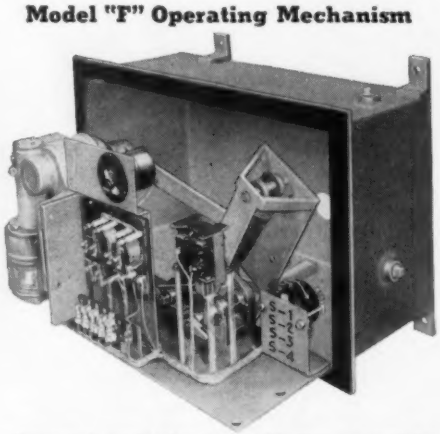


Type "RAD" double throw oil switch unit with Model "F" automatic mechanism.

Model "F" Operating Mechanism



TYPE "DRA" two single throw oil switch unit with Model "F" automatic mechanism. Air filled isolating link box on top.



Improved mechanism removable from watertight case. Motor compresses spring which, when released through action of relays and solenoid, operates the oil switch.

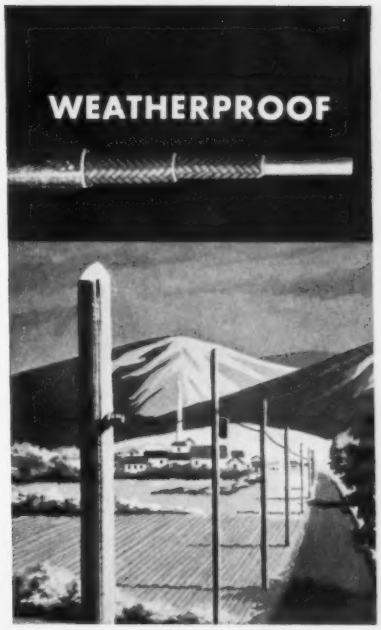
The automatic mechanisms are applied to various forms of Type "RA" oil switches, either for underground cables or overhead connections—up to 23 Kv., 400 amperes. All control wiring is done at the factory. Installation of the unit merely involves connection of the feed and load cables or wires.

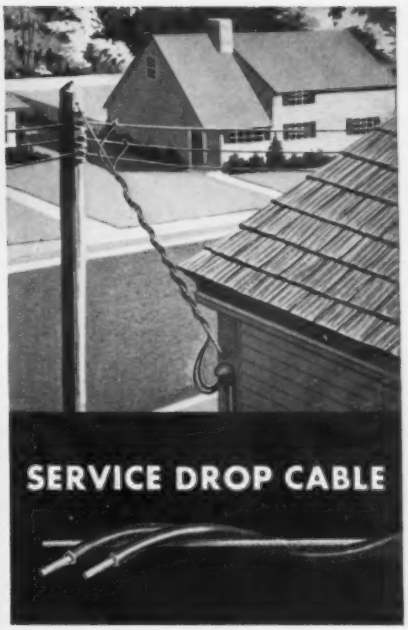
Send for Bulletin DA-F which fully describes Model "F" mechanism.

G&W ELECTRIC SPECIALTY CO.
7780 Dante Avenue, Chicago 19, Illinois, U.S.A.

Representatives in principal cities of U.S.A.
In Canada—Powerlite Devices, Ltd., Toronto, Montreal & Vancouver

D561





GENERAL CABLE

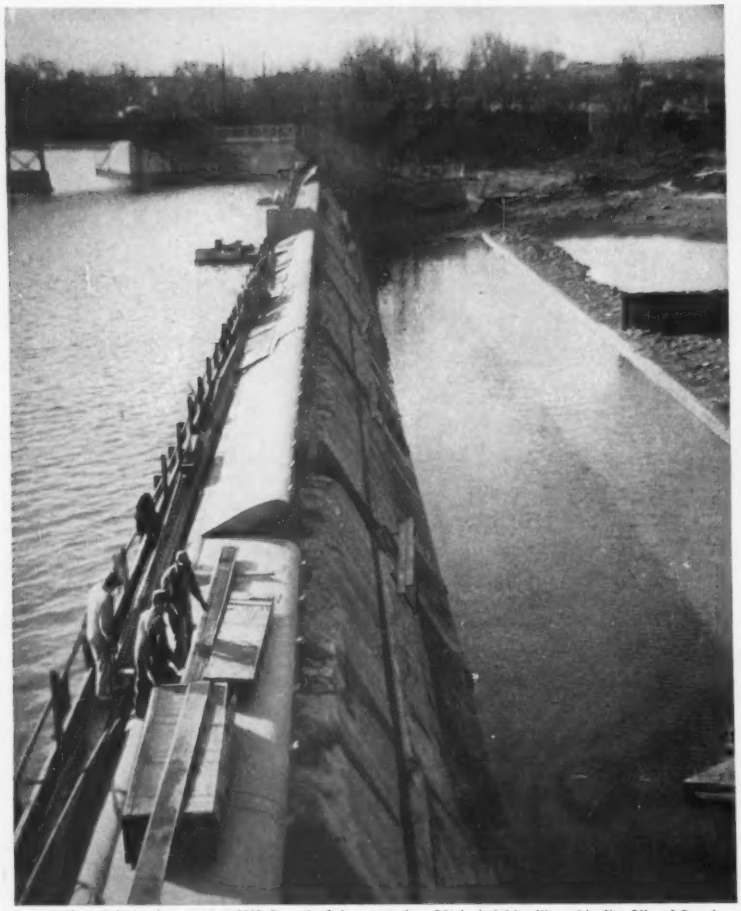
ALECTRAL

FOR ALL ALUMINUM CONDUCTOR REQUIREMENTS

Built into all ALECTRAL products are 75 years of General Cable's engineering and manufacturing experience. In this record are more than 25 years of successful performance of *insulated* aluminum conductors marketed as ALECTRAL. Available in ALL-ALUMINUM, ACSR, WEATHERPROOF and with RUBBER and THERMOPLASTIC insulations. A sound and economical investment for all voltage ranges.

GENERAL CABLE CORPORATION, 420 Lexington Avenue, New York 17, N. Y.
Offices and Distribution Centers Coast-to-Coast

For quality and service...SPECIFY GENERAL CABLE



Installation of these two 5′-high SMS Bascule Gates on a dam 28′ in height will enable the City of Decatur, Illinois, to more than double its present water storage capacity, even in dry years. The training wall and concrete pier between the gates is designed to minimize downstream cross-flow and damage to the apron. Harza Engineering Co., Chicago, Illinois, Consulting Engineers.

Individual 29′-long sections of the gate are installed in graphited bronze bearing shoes. A Bascule Gate was chosen over other types here when engineering studies proved it most economical and simplest.

View from downstream side shows final connection of one of the several hydraulic operating cylinders for each gate. Piping on the face of the dam immediately below provides individual isolation of any cylinder.

One of the two 500 psi oil accumulator tanks is about to be raised into position at the control station. Pumps supply pressure to the accumulator tanks for emergency operation in the event of power failure.

New SMS Bascule Gate Design Provides a CLEAR CREST, UNLIMITED LENGTH

Now SMS Bascule Gates can be built to any length you need, and installed without intermediate piers or overhead structures. With this new SMS design, hydraulic operators are located under the gate leaves and controlled from either end. The installation shown above consists of two 233′9″ gates. They are the longest ever installed.

An SMS Bascule Gate will increase the storage and spillway capacity of existing dams quickly and economically. It enables you to control heavy run-offs without losing stored water, and to handle regional hazards like ice and heavy debris. In its open position, the gate lies flat on the dam crest and presents no obstruction to flow.

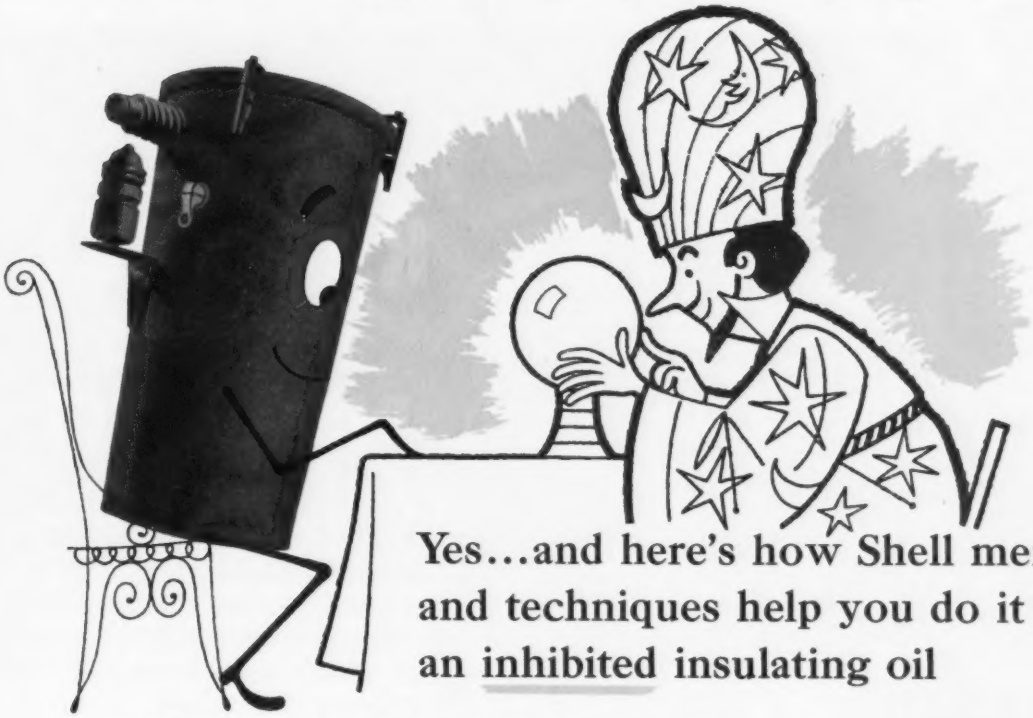
For full information on this new SMS Bascule Gate design—or on hydraulic turbines and other accessories—write to S. Morgan Smith Co., York, Penna.

S. MORGAN SMITH

AFFILIATE: S. MORGAN SMITH, CANADA, LIMITED, TORONTO

HYDRAULIC TURBINES
PUMPS
GATES & HOISTS
TRASH RAKES
LIQUID HEATERS
HYDRODYNAMICS
ROTOVALVES
BALL VALVES
BUTTERFLY VALVES
FREE DISCHARGE VALVES
CONTROLLABLE-PITCH SHIP PROPELLERS

Can you more than triple the "life expectancy" of equipment?



Yes...and here's how Shell men and techniques help you do it with an inhibited insulating oil

Shell Research men knew that oil oxidation was the villain in much equipment deterioration. So they set out to develop an oil which would effectively "fight" oxidation—main cause of harmful acids and sludge.

To find the *perfect combination,* Shell scientists teamed and tested hundreds of specially-refined base oils with Shell's own oxidation-inhibitor. The one combination that proved *outstanding* was SHELL DIALA OIL AX.

This remarkable insulating oil resists oxidation so effectively, many users report it is still acid and sludge-free years after ordinary oils would have failed. Because of this you can get 3 to 5 times the usual service life on your electrical equipment—without frequent oil purification and costly maintenance.

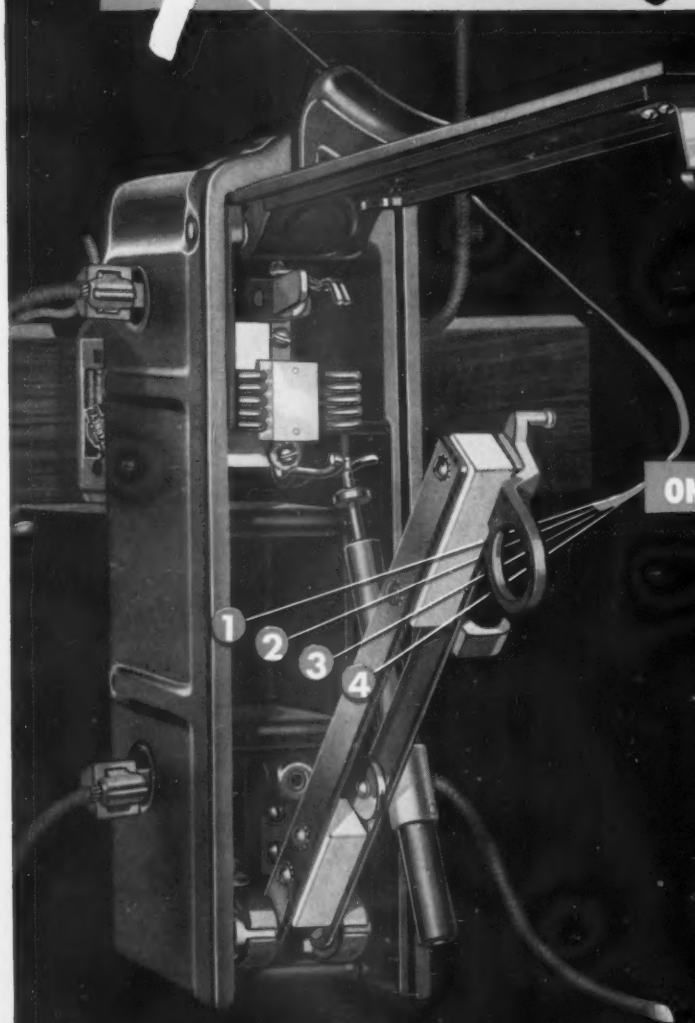
First—and proven *best* in its field—SHELL DIALA OIL AX is just one of many fine products developed by Shell's 1500-man research team, a team with 25 years' experience in gasoline and lubrication problems.

A telephone call can put this team to work solving your problems. Call in your Shell representative today.

SHELL

SHELL DIALA OIL AX

4 Switching Operations

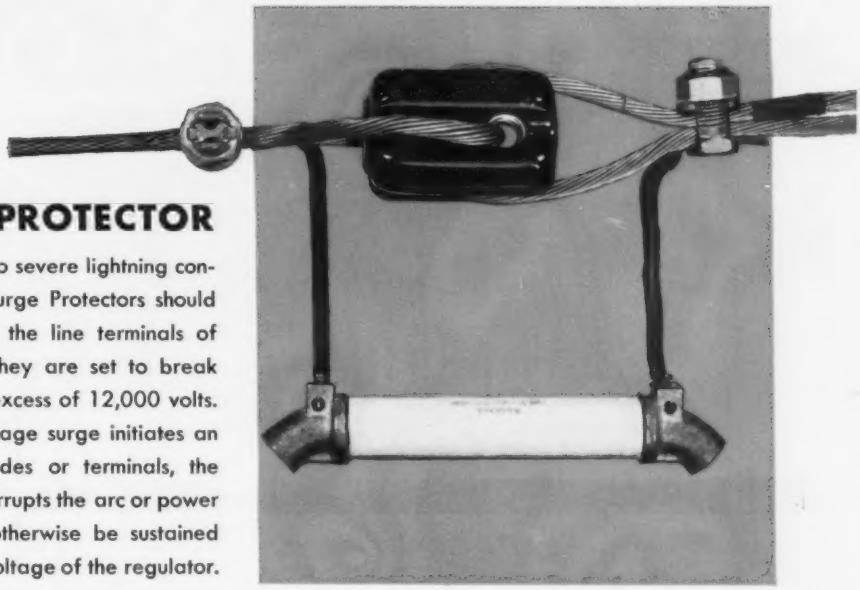


of this KEARNEY BY-PASS DISCONNECT

ONE PULL of the ring safely accomplishes four operations in proper switching sequence. . . without load disturbance or arcing at contacts. In the same time it takes to open one conventional disconnect, the KEARNEY By-Pass Disconnect shunts the line leads to by pass the regulator, opens both leads to the regulator, interrupts exciting current. Coordination of by-pass element action with blade movement assures positive make-before-break contact on switch opening and closing. And since only one By-Pass does the job of three single-throw disconnects, you save both time and money.

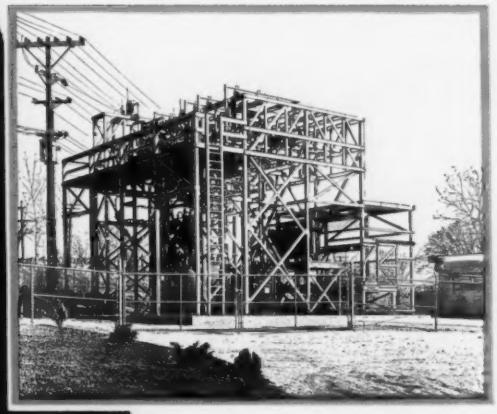
JAMES R. KEARNEY CORPORATION
4224-42 Clayton Avenue • St. Louis 10, Missouri
Canadian Plant: Guelph, Ontario

with one pull



SURGE PROTECTOR

In localities subject to severe lightning conditions, KEARNEY Surge Protectors should be mounted across the line terminals of By-Pass Switches. They are set to break down on surges in excess of 12,000 volts. If an abnormal voltage surge initiates an arc across the blades or terminals, the Surge Protector interrupts the arc or power flow which would otherwise be sustained by the secondary voltage of the regulator.



Switches Field-Tested

Here at KEARNEY'S Substation Laboratory of 150,000 KVA Transformer Capacity—with a back up power of 445,000 KVA—all equipment is tested under rigorous field conditions. KEARNEY Certified Ratings are actual, proved performance ratings... not just theoretical calculations. You can be sure they will do the job they are supposed to do... with a generous margin of safety.

-315

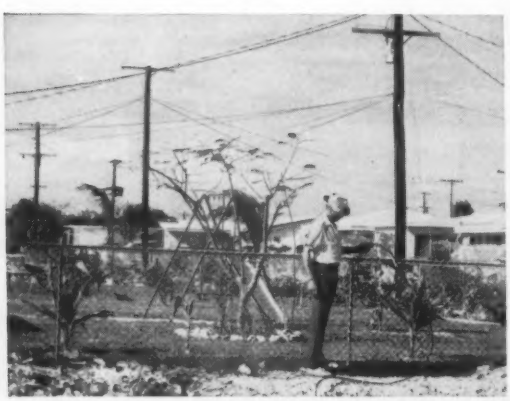
for BETTER CONSTRUCTION
SAFER MAINTENANCE
Specify KEARNEY PRODUCTS

JAMES R. KEARNEY CORPORATION ST. LOUIS, MO. GUELPH, ONT.

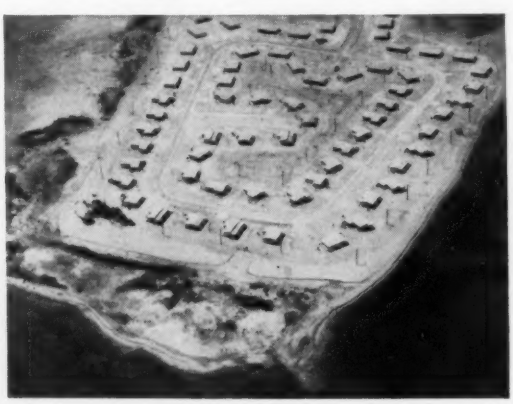
The Mark of Quality

MAYDWELL & HARTZELL, INCORPORATED • WEST COAST DISTRIBUTORS • Los Angeles • San Francisco • Portland • Seattle • Spokane • Phoenix

ONE-THIRD of this 25-mile line is over salt water. Scene above shows a channel crossing with 4/0 ACSR, with the Atlantic Ocean on the left. This is a good example of the unusual problems solved by Key West Electric with Kaiser Aluminum conductor.



R. C. VIRGIN, Superintendent of Transmission and Distribution, inspects Kaiser Aluminum triplex which is used extensively for services in fast-growing Key West.



NEW HOUSING DEVELOPMENT in booming Key West is built on man-made fill extending into the Gulf of Mexico. All conductor is aluminum.

ACSR LINE feeds new shrimp dock and basin (shown under construction). This is now one of the nation's largest shrimp docks. Some 400 shrimp trawlers operate from the area.

SALT-LADEN KEY WEST "HAS NO PROBLEMS" WITH KAISER ALUMINUM WIRE!

Key West Electric successfully uses Kaiser Aluminum conductor in salty atmosphere for economy and good service

THE City of Key West Electric System—entirely surrounded by salt-water—today uses *only aluminum* conductor for its bare primaries, secondaries and service drops.

According to Mr. M. E. Rosam, Manager, "In spite of our heavy salt-water atmosphere, we have experienced no trouble with Kaiser Aluminum conductor.

"There is no secret to our success with aluminum in this area. We simply follow the best aluminum-handling practices and employ aluminum connectors that have proved reliable under our conditions. We make a simple field treatment with an oxide inhibitor.

"We get gusts of wind up to 75 mph on this island—yet we've never had a failure with Kaiser Aluminum triplex.

"In all phases of our construction, Kaiser Aluminum engineers have given us invaluable assistance."

Growth of Key West Electric

During the last 10 years, Key West population has tripled. And the progressive Key West Electric System has kept the pace with major expansions.

Extensions of the original system include service to the Boca Chica Air Base on Boca Chica Key, and to customers located on adjacent Stock Island. Service also has been extended to major housing developments, and to the Lower Keys as far as Big Pine Key. This 13.8 kv line is approximately 30 miles long and serves about 275 customers.

The entire Key West Electric System now serves more than 9,500 customers.

K/W service available to you

During the rapid expansion of the electrical industry, Kaiser Aluminum has concentrated intensively on utility problems, with emphasis on covered wire. Today, Kaiser Aluminum is the nation's fastest growing producer of aluminum wire and cable, making available the latest helpful information on modern products and practices.

A Kaiser Aluminum representative or a K/W distributor will give you immediate attention. Contact your Kaiser Aluminum sales office. Kaiser Aluminum & Chemical Sales, Inc., *Executive Office*, Kaiser Building, Oakland 12, California; *General Sales Office*, Palmolive Building, Chicago 11, Illinois.

Kaiser Aluminum

Aluminum is the answer to Adequate Wiring

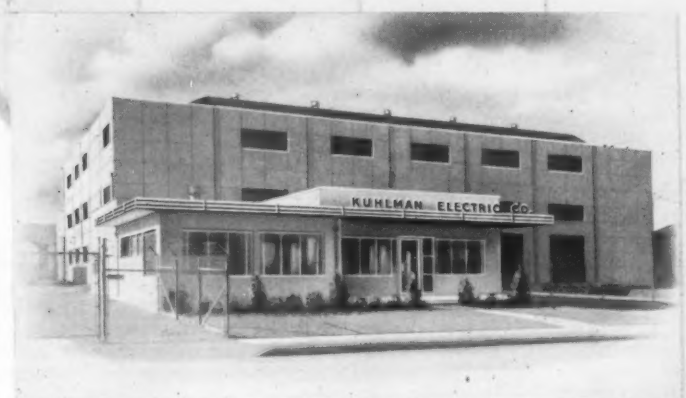
To Serve Better - Electrically

Now... a KUHLMAN transformer factory in the West...to serve the West

The newest of Kuhlman's three transformer factories is serving the growing West. In operation since November, 1955, this modern Western Division factory at Salinas, California meets the growing demand for Kuhlman distribution transformers in the eleven Western states.

With sales offices and distributing centers in principal cities throughout the West, Kuhlman is well situated to serve your day-to-day transformer needs. Short shipping distances to all points in the West assure fast transformer deliveries from factory or from stocks. You'll like our friendly service, too—especially the prompt, personal attention we give your every inquiry and order.

But the real long-life service begins when a Kuhlman transformer is installed on the job. For 62 years this type of long-life transformer service to utilities and industries across the country is your proof of Kuhlman dependability. Ask your local Kuhlman representative to explain the many service benefits you now get with Kuhlman in the West.



YOU ARE CORDIALLY INVITED to visit the modern Kuhlman transformer factory at Salinas, California . . . *we hope to see you soon.*

KUHLMAN ELECTRIC COMPANY

5612

BAY CITY, MICHIGAN • CRYSTAL SPRINGS, MISSISSIPPI • SALINAS, CALIFORNIA

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ROCKBESTOS A.V.C.®

(N.E.C. TYPE AVA)

INTERLOCKED ARMORED CABLE

FOR New Buildings
Expanding Existing Circuits
Relocating Old Circuits

Rockbestos A.V.C. Interlocked Armored Cable gives you more current capacity than cable in conduit or other armored cable . . . is easily installed on racks or hangers beneath the ceiling or next to walls . . . can be installed up, down or around walls, beams or posts. It eliminates costly conduit and ducts . . . saves dollars on these materials . . . easier to install . . . cuts installation time . . . permits quick easy repairs.

Write for the new manual which gives application and design data for Rockbestos A.V.C. Interlocked Armored Cable.

ROCKBESTOS PRODUCTS CORPORATION
NEW HAVEN 4, CONNECTICUT
New York • Cleveland • Detroit • Chicago
Pittsburgh • St. Louis • Los Angeles • Seattle
New Orleans • Oakland, California

"When you're as old as me, sonny,
this meter will still be working!"

Tom Barnes, Mgr. Meter Engineering, Says:
"WE ARE CERTAIN THAT LOAD GROWTH WILL NEVER MAKE THIS METER OBSOLETE."

The New Westinghouse 30-Ampere Meter

Good news! For only pennies a year over the cost of ordinary meters, you can buy the new 30-ampere Westinghouse Lifetime Meter. It's good insurance against load-growth problems. This new meter will handle all single-phase loads up to 200 amperes.

Few homes *today* require 200-ampere meters. But how about the future? Industry forecasts predict a tremendous growth in the use of electric power, particularly in the home.

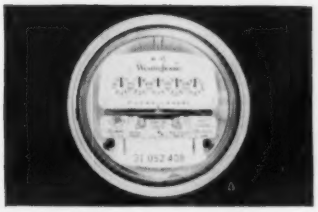
The 30-ampere meter gives you a substantial cushion against this future load growth. It is your guarantee that whatever the future, your meters will have the capacity to handle the load.

In most localities, testing requirements are the same as for 15-ampere meters. For only a little more, you get twice the metering capacity when you specify 30-ampere Lifetime Meters.

For more information, see your Westinghouse sales engineer or write Westinghouse Electric Corporation, 3 Gateway Center, P.O. Box 868, Pittsburgh 30, Pa.

J-40489

New 30-ampere meter gives you all the Lifetime features



10,000-volt impulse insulation level in current and potential coils. De-ion® gap discharges outside the meter at 6500-volt impulse for lightning protection. Corrosion resistance in all components. Full and light-load adjusters are linear, 20% range, accessible from the front.

Alnico damping magnets for extreme stability. Famous Westinghouse ball-and-jewel bearing, a proved Lifetime bearing.

WATCH WESTINGHOUSE

*WHERE THE **FUTURE** IS **ALREADY** IN PRODUCTION!*

Specify PHELPS DODGE HABIRITE-INSULATED ARMO-LOK CABLE

Phelps Dodge Armo-Lok cable with Habirite (butyl rubber) insulation—a companion to Phelps Dodge Varnished Cambric insulated interlocked armor cable—is more than "just another interlocked armor cable."

Habirite—developed through years of Phelps Dodge experience in the design and manufacture of high voltage cables — is a specially engineered butyl rubber compound. It far surpasses any other type of rubber insulation for dependable service.

Habirite offers these distinct advantages over other rubber insulations:

- Far greater resistance to heat and oxidation with consequent higher temperature rating and lower conductor size and cable cost.
- Far greater resistance to ozone found around high voltage equipment.
- Far greater mechanical toughness.
- Better electrical properties affording a greater safety factor in operation.
- Highest uniformity due to controlled uniformity of raw material.

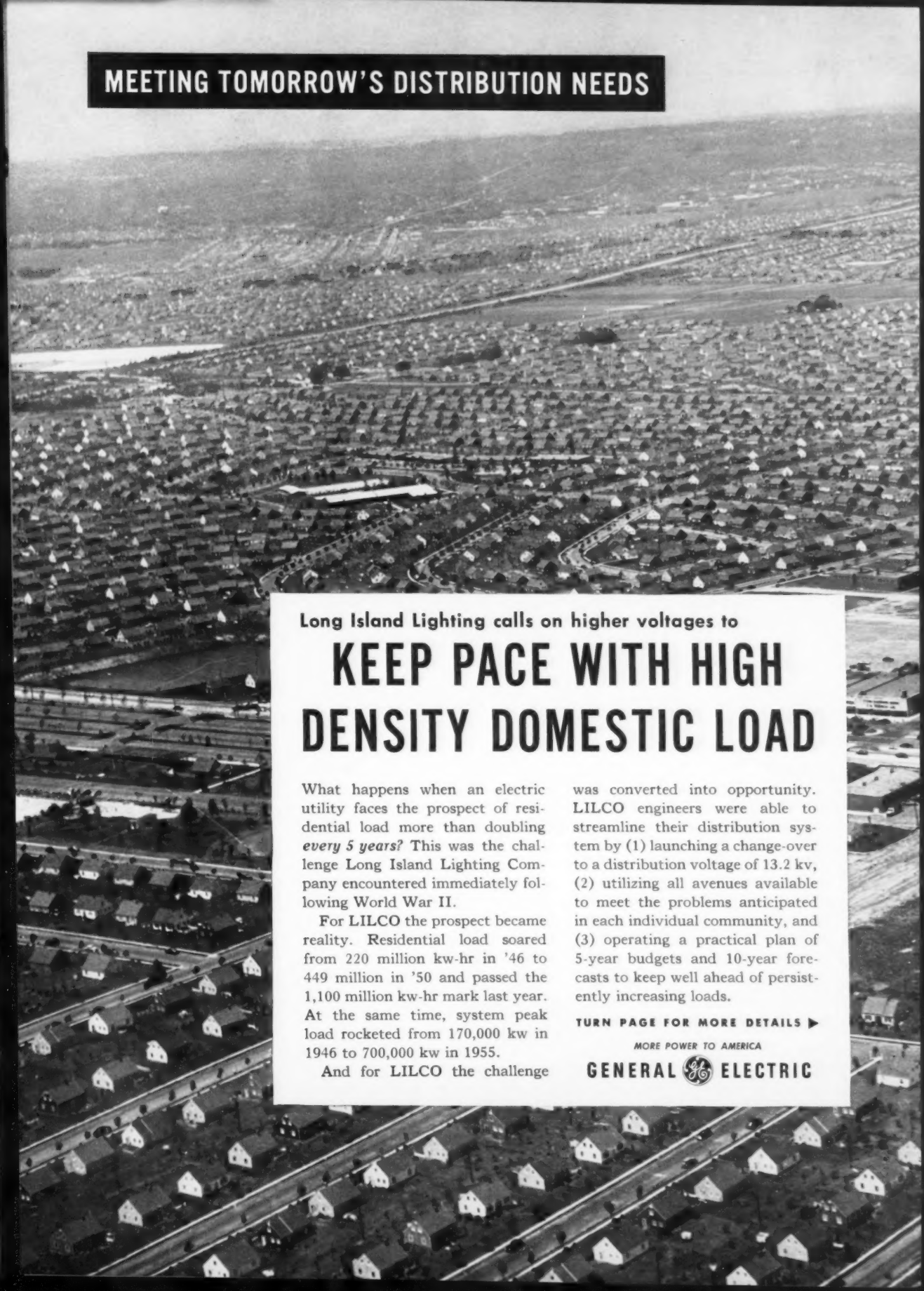
★ ★ ★

See your Phelps Dodge distributor for information on a complete Armo-Lok system. For catalogue and specification data on Habirite or Varnished Cambric insulated Armo-Lok cable, write: Dept. WE-7, Phelps Dodge Copper Products Corporation, 300 Park Avenue, New York 22, N. Y.

PHELPS DODGE COPPER PRODUCTS CORPORATION

SALES OFFICES: Atlanta, Birmingham, Ala., Boston, Buffalo, Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Fort Wayne, Greensboro, N. C., Houston, Jacksonville, Kansas City, Mo., Los Angeles, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Ore., Richmond, Rochester, N. Y., San Francisco, St. Louis, Seattle, Washington, D. C.

MEETING TOMORROW'S DISTRIBUTION NEEDS



Long Island Lighting calls on higher voltages to

KEEP PACE WITH HIGH DENSITY DOMESTIC LOAD

What happens when an electric utility faces the prospect of residential load more than doubling *every 5 years?* This was the challenge Long Island Lighting Company encountered immediately following World War II.

For LILCO the prospect became reality. Residential load soared from 220 million kw-hr in '46 to 449 million in '50 and passed the 1,100 million kw-hr mark last year. At the same time, system peak load rocketed from 170,000 kw in 1946 to 700,000 kw in 1955.

And for LILCO the challenge was converted into opportunity. LILCO engineers were able to streamline their distribution system by (1) launching a change-over to a distribution voltage of 13.2 kv, (2) utilizing all avenues available to meet the problems anticipated in each individual community, and (3) operating a practical plan of 5-year budgets and 10-year forecasts to keep well ahead of persistently increasing loads.

TURN PAGE FOR MORE DETAILS ▶

MORE POWER TO AMERICA

GENERAL ELECTRIC

MEETING TOMORROW'S DISTRIBUTION NEEDS

MAXIMUM SERVICE CONTINUITY is assured by G-E distribution transformers. Above, W. O. Smith, Ass't. Vice Pres. & Mgr., Elec. Operating Dept.; C. Kiel, Jr., Ass't. Mgr., Elec. Oper. Dept.; and R. M. Grogan, Mgr., Meter and Distribution Engineering, all of LILCO, note clean arrangement of General Electric line transformer and triplex service. The secondary conductors shown here are aluminum.

LOW AND COMPACT design of G-E unit substation enabled LILCO to do attractive landscaping, keep local good will high, as discussed by W.O. Smith; F.G. Josberger, Distribution Engineer; C. Kiel, Jr., and R.M. Grogan.

Long Island

EXTRA FLEXIBILITY of G-E equipment is demonstrated by single-phase transformer with cabled secondary and services supplying residences. Streamlined design is explained by G.E.'s E. J. Bateman to Long Island Lighting's L. G. Colson and R. Hickson.

EXTENDED LIFE of G-E meters helps utilities cut maintenance costs. This bank of G-E meters in an apartment house holds attention of Long Island Lighting Company's G. R. Sullivan and W. A. Hickson, Jr.

MAGNETIC SUSPENSION and cyclometer register features in G-E I-55 meters are discussed by E. J. Bateman, G-E sales engineer, with LILCO's J. Dye (l), Superintendent—Meter & Test Section, and R. M. Grogan (r). New meter design assures straight-line accuracy to 100 amperes.

IMPROVED VOLTAGE CONDITIONS, helping systems carry more load, are two reasons for installing G-E capacitors. Above, G.E.'s M. Lennig (l) checks performance of 300-kvar G-E switch capacitor bank with LILCO's J. A. McDougall, and R. Hickson, Distribution Planning Engineer.

Lighting Co. activates long-range plans to expand distribution system capacity

Reliability of General Electric apparatus aids in boosting service continuity

The now-historic post-war home building boom on Long Island meant that larger and larger blocks of power would be needed. Even more important, this power must be made available at easily usable voltages for local distribution. Starting from there, Long Island Lighting engineers launched a program to raise transmission voltages from 66 to 138 kv and capitalized on the advantages of 13.2 kv for distribution. Result: during the record-breaking winter peak of 1955, more than 45 per cent of LILCO's total load was served economically and efficiently over the 13.2-kv lines.

To put such plans into action, LILCO decided to utilize the best equipment available. Much of this apparatus was selected from General Electric's complete line.

When you, like LILCO, specify G.E., you take advantage of the latest advances in apparatus design, construction and application. That's because G-E engineers are able to translate the trends and needs of growing systems as reported by G-E field personnel, incorporate newest materials and manufacturing techniques in producing them, and provide help in putting these advances to best possible use on your system.

And to help utilities keep service running smoothly, highly trained G-E service engineers plus a nation-wide network of G-E Service Shops stand ready to meet any and all maintenance and repair needs—day and night.

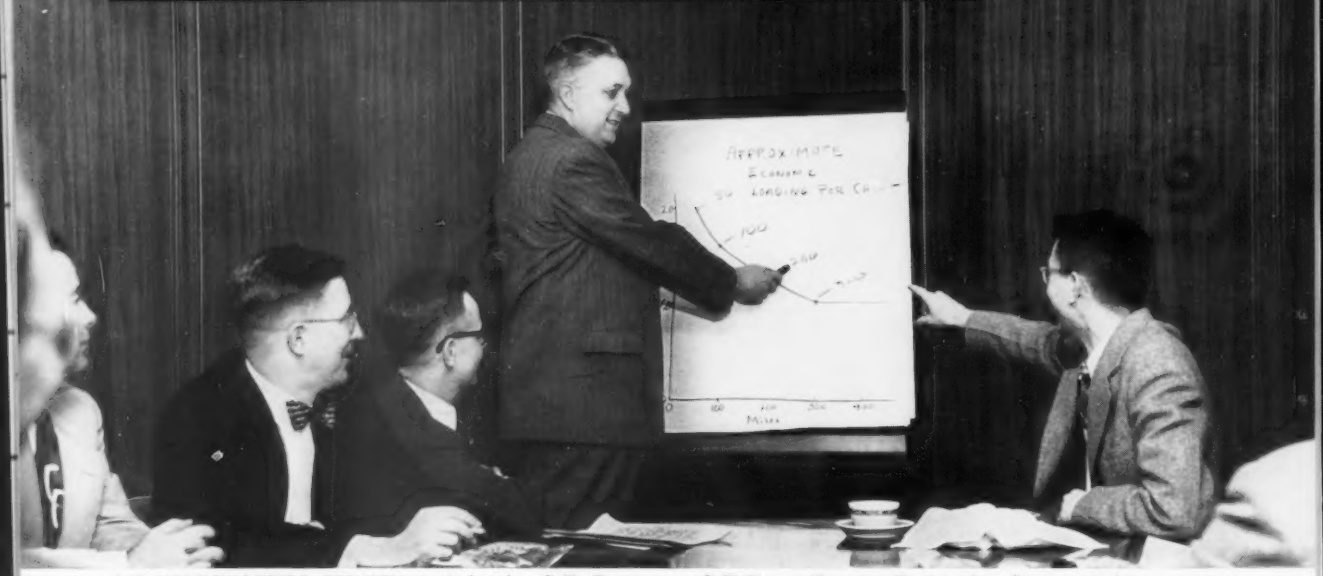
For full information on General Electric distribution equipment and distribution system services, contact your nearby G-E Apparatus Sales Representative, authorized G-E Agent, or G-E equipment distributor today. Or write General Electric Company, Section 303-1, Schenectady 5, N. Y.

TURN PAGE FOR MORE ON MEETING TOMORROW'S DISTRIBUTION NEEDS

MORE POWER TO AMERICA

GENERAL ELECTRIC

MEETING TOMORROW'S DISTRIBUTION NEEDS



G-E HEADQUARTERS SERVICES include the G-E Power Systems Engineering Course, the Electric Utility Systems and Practices Course, and board studies. Above, at the G-E Power Systems Engineering Course, engineers review basic approaches to system designs that will help step up system efficiency, improve consistency of service.

G-E Power Systems Engineering Course helps utilities plan for future with sound ideas

Part of General Electric's continuing program to assist electric utilities in meeting today's growing demands for electric power is the G-E Power Systems Engineering Course. In this course, promising young utility personnel are given the opportunity to study advanced electric utility system theory and practice. As a result, utilities are able to train men to incorporate latest ideas into system designs.

The full range of G.E.'s distribution system services includes headquarters system planners—district application and product engineers—extensive product development facilities—equipment installation and field service engineering—complete interflow of ideas. To the electric utility industry, these services offer assurance of maximum operating continuity, on-the-spot application help, greater equipment efficiencies, valuable help in system design and techniques.

Get the full story from your G-E Apparatus Sales Representative. General Electric Company, Schenectady 5, N. Y.

MORE POWER TO AMERICA

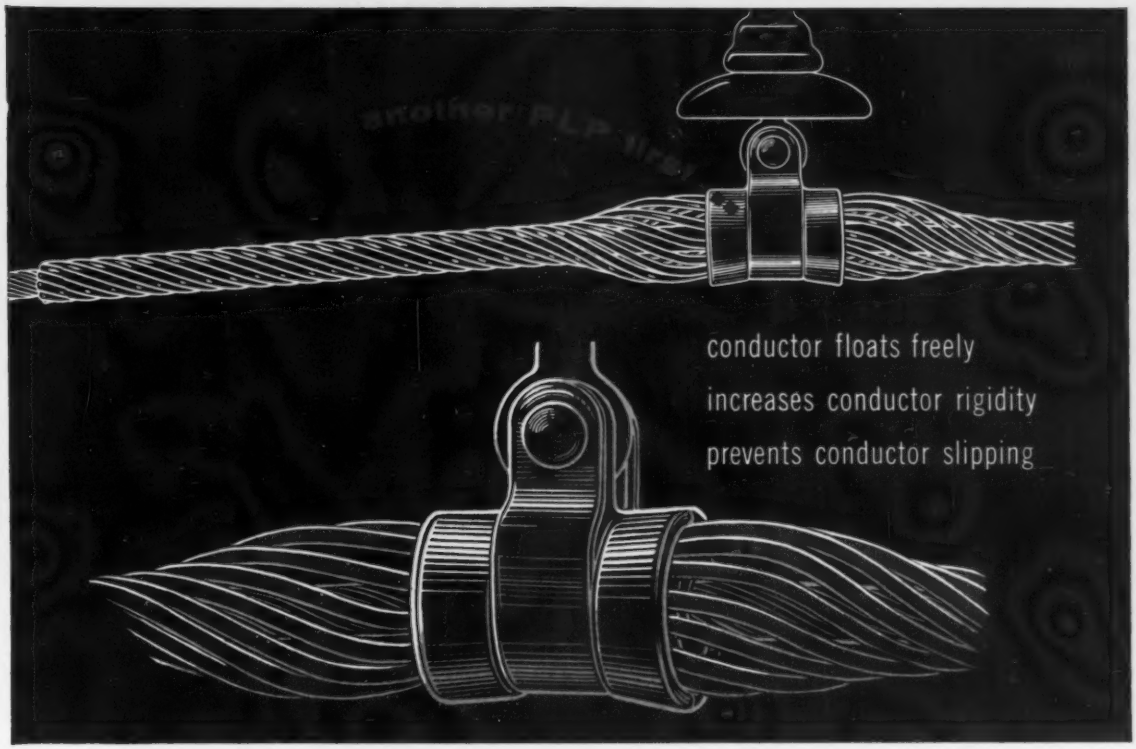
GENERAL ELECTRIC

More Reasons Why It Pays to See G.E. About Distribution Problems

LOCAL APPLICATION ENGINEERS assist utility engineers with system designs, equipment-type selection, application problems early. Answers speed practical use of latest ideas, product advances.

GREATER EQUIPMENT RELIABILITY comes from tireless product development and research. Here flame-retardant, self-extinguishing insulation for G-E metal-clad switchgear gets appraisal before use.

APPLICATION OF ADVANCED IDEAS is assured by district electric utility application engineers. At forums held by General Electric, these engineers study the latest answers to field problems.



an entirely new concept in suspension design

After five years of intensive laboratory research and field experience, Preformed Line Products Company announces the ARMOR-GRIP SUSPENSION. This is not just a modification of the conventional clamp—in fact, in a sense it is not a "clamp" at all. The ARMOR-GRIP SUSPENSION is a "floating suspension"—the conductor is cradled in neoprene and firmly gripped only by the custom-designed Preformed Armor Rods which distribute their pressure over a relatively large area. An ingenious relation between rods and housing prevents the suspension assembly from slipping longitudinally. The expanded configuration of the PLP rods also adds rigidity to the conductor while slight vertical resilience of the conductor mounting eliminates a steep stress gradient.

THE ARMOR-GRIP SUSPENSION ELIMINATES CONCENTRATED CLAMPING STRESSES.

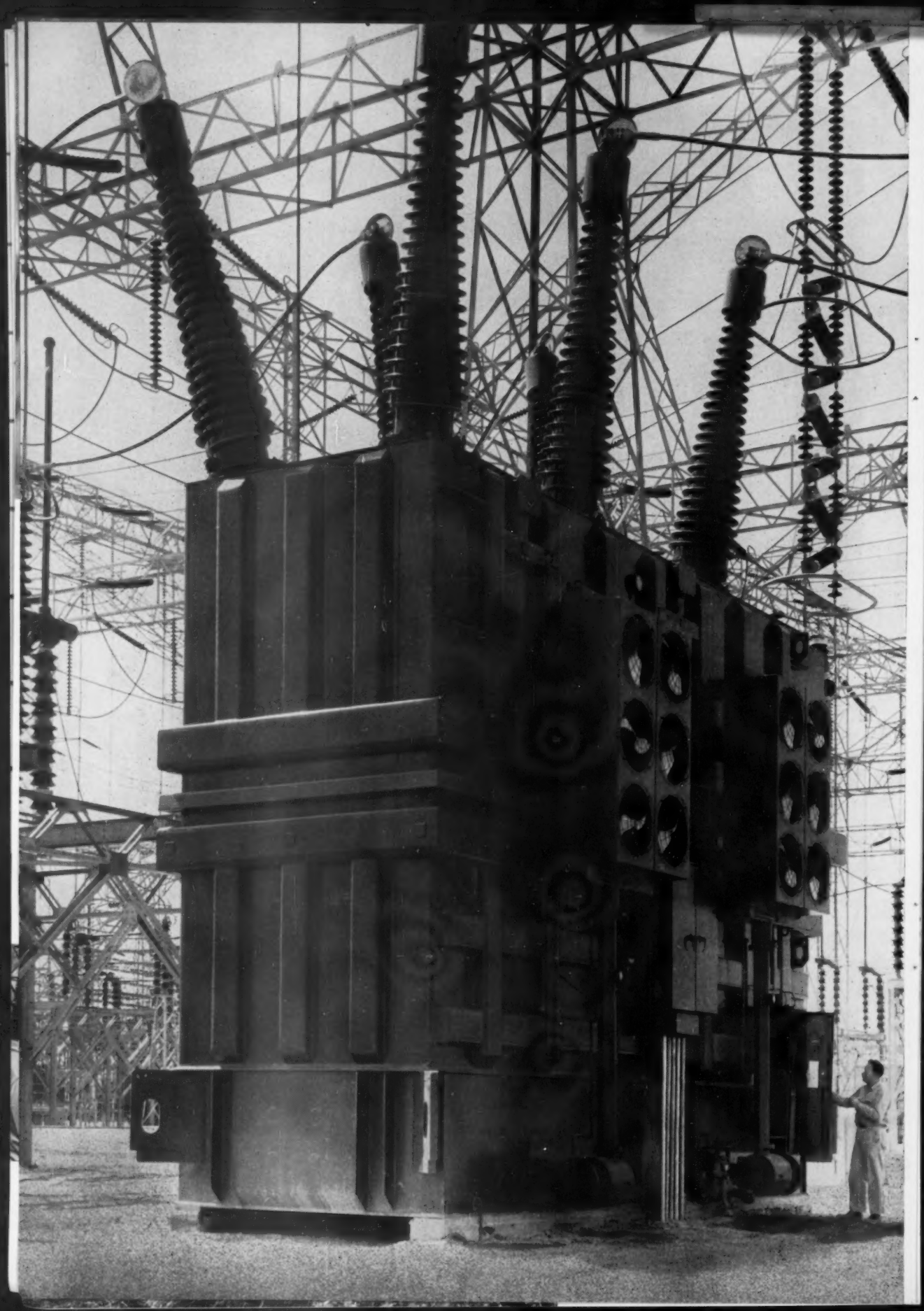
In severe accelerated vibration tests, conductor mounted in the PLP ARMOR-GRIP SUSPENSION outlasts conventional clamp assemblies many times—in fact, no conductor failures have ever occurred under the ARMOR-GRIP SUSPENSIONS in these tests. Thousands of ARMOR-GRIP SUSPENSIONS have been installed during the past four years—with NO reported case of unsatisfactory performance.

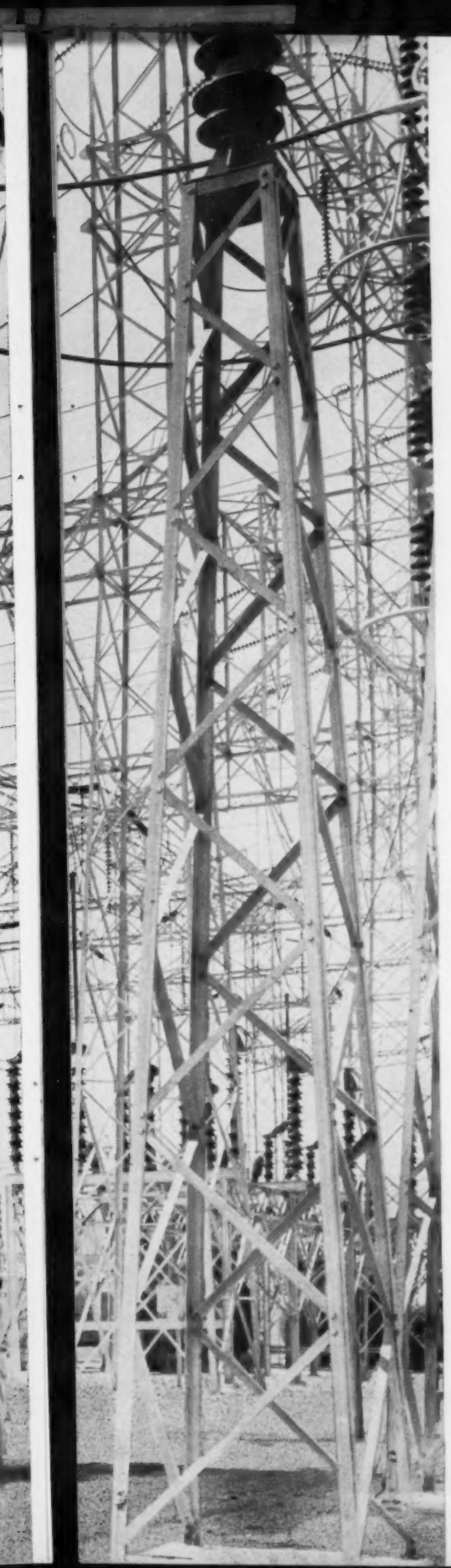
Yet with all these functional advantages, the ARMOR-GRIP SUSPENSION is very easy to install. Simplicity of design has eliminated many parts—there are less than one-half the number contained in a conventional clamp assembly. Only one nut to tighten.

The ARMOR-GRIP is immediately available in conductor sizes in the ranges of 336,400 cm, 477,000 cm, 795,000 cm, 954,000 cm ACSR and All-Aluminum. Other sizes will soon be available and can be produced on request.

Made in accordance with or for use under one or more of the following U. S. Patents: 2,722,393; 2,275,019; 2,587,521; 2,609,653; 2,691,865; other patents pending.

PREFORMED LINE PRODUCTS COMPANY
5349 ST. CLAIR AVENUE • CLEVELAND 3, OHIO
TELEPHONE: CLEVELAND EXPRESS 1-3571





World's largest at 400,000 kva...

greatest transformer capacity ever applied to a transmission system

News was made recently with the installation of the world's largest autotransformer at the Tanners Creek plant of the Indiana & Michigan Electric Co., Lawrenceburg, Indiana. This 330-kv unit and another identical twin, both built by Westinghouse, are the only transformers of this enormous capacity ever operated on a transmission system.

One glance will show you the giant proportions of this transformer compared with the man in the foreground—33 feet high from base to bushing tip, 30 feet long, 16 feet wide, and weighing 574,000 pounds oil-filled. Despite the literal immensity of the transformer, it is the Westinghouse Form-Fit design with forced-oil cooling which made it practical to construct and ship this 3-phase unit—a new achievement in power conversion for the electric utility industry.

With the development of this new capability in transformers, it is still a fact that Westinghouse Form-Fit transformer design provides minimum bulk consistent with low losses, offering you maximum year-in and year-out operating economy and over-all performance you can depend on.

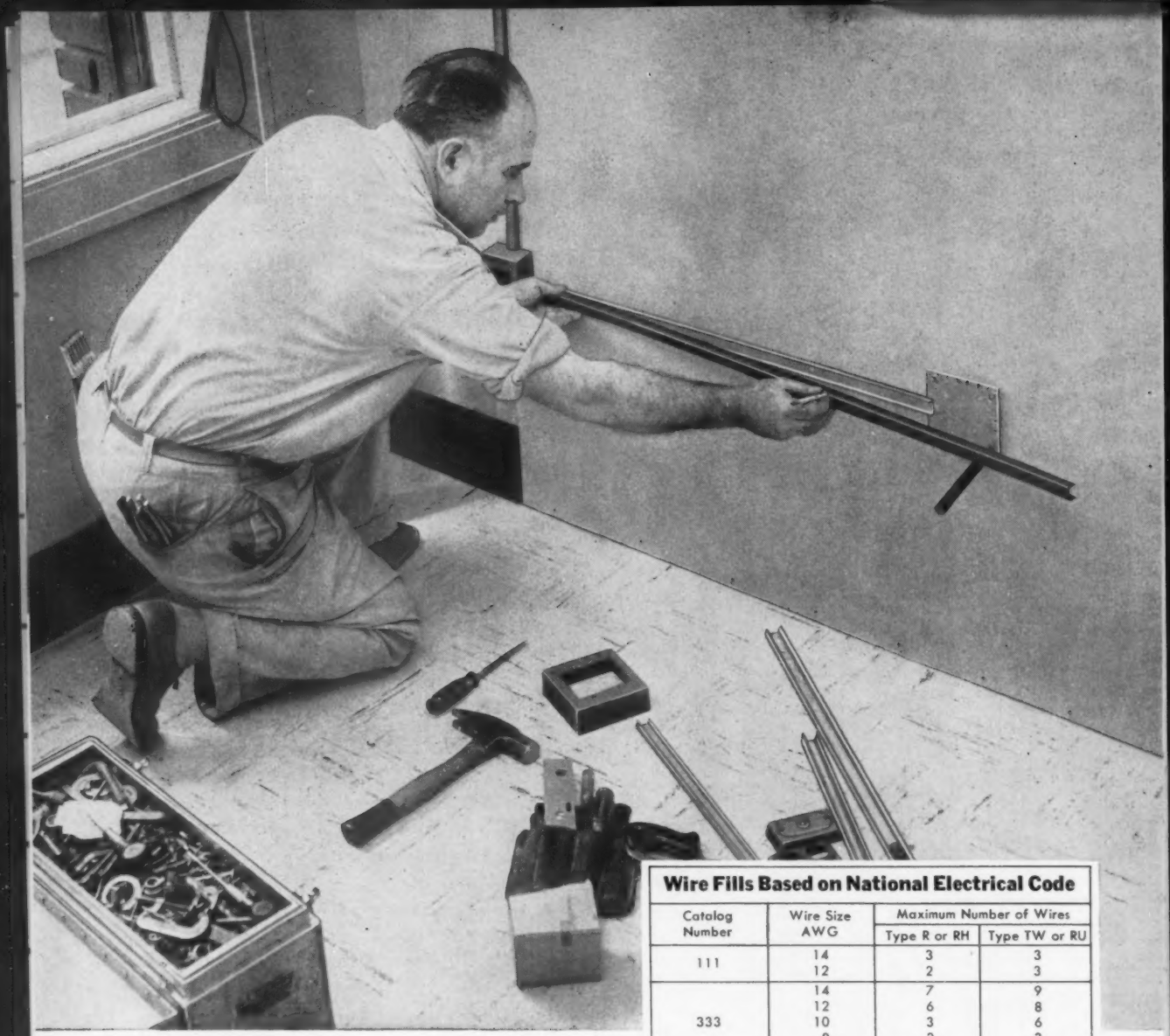
For more particulars, get in touch with your Westinghouse Sales Engineer, or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-70736

The greatest concentration of power conversion equipment ever applied to a 330-kv system is shown here at the Tanners Creek plant of the Indiana & Michigan Electric Co.

YOU CAN BE SURE...IF IT'S

Westinghouse

Plants at Berkeley, Calif.; Sunnyvale, Calif.; Emeryville, Calif.; Los Angeles; Portland; Salt Lake City; Seattle; Denver



"ON THE SURFACE" WIRING SAFE AND FAST...

with National Electric Metal Molding

National Electric Metal Molding is one of six steel surface electrical raceways made by National Electric. It's for quick, safe, electrical installations in homes and buildings of all types. Easy to install. Just fasten the base into position, lay in the wires, and snap on the capping. Catalog available with full information.

Listed by Underwriters' Laboratories, Inc.

National Electric Products

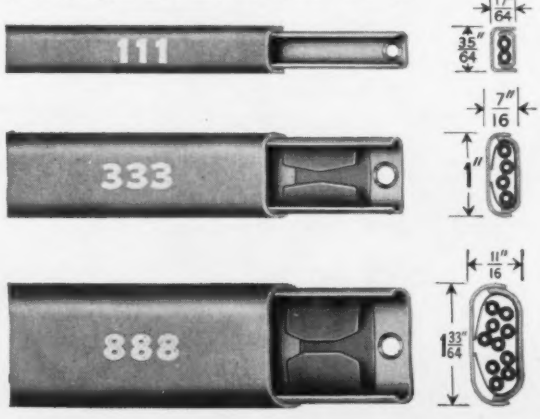
TORRANCE, CALIFORNIA

Branch Offices: San Francisco • Seattle • Denver • Los Angeles • Salt Lake City • Portland • Phoenix

Wire Fills Based on National Electrical Code

Catalog Number	Wire Size AWG	Maximum Number of Wires	
		Type R or RH	Type TW or RU
111	14	3	3
	12	2	3
333	14	7	9
	12	6	8
	10	3	6
	8	2	3
	6		2
888	14	10	10
	12	10	10
	10	9	10
	8	7	10
	6	4	5

National Electrical Code limits wire fill to ten conductors



PRODUCT NEWS

New Designs and Applications

Fastening Tool

(1) Ramset Fastening System, Olin Mathieson Chemical Corp., 460 Park Ave., New York 22, N. Y.

The well-known fact that a needle can be driven through a coin if it is first driven through a cork is applied to this new fastening tool. The result is a tool capable of driving various kinds of fasteners through ¼-in. steel using only a hammer as the driving force. It ends much of the need for such fastening devices as toggle bolts, expansion shields, anchors and concrete nails, according to the manufacturer. It is also presented as the way out of tedious star drilling. Using a variety of fasteners, the tool drives them by force of a hammer blow on the anvil head, which passes the force to a driving pin and then to the fastener. It seats both threaded and pin fasteners. A cost comparison between using the tool for fastening conduits to concrete showed 100 fasteners set with the tool for $9.95 as compared with conventional fastening costing $23.50. Special fasteners were developed for the new tool. Drive pins range from ¾ in. to 3 in. in length; threaded studs are from ⅜ to ⅝ in., with varying shank lengths. The tool and accessories in a metal carrying kit are available from Ramset dealers across the nation now. Cost is $27.95. Fasteners are shown in inset on photo above.

Convector Wall Furnaces

(2) Wesix Electric Heater Co., 390 First St., San Francisco, Calif.

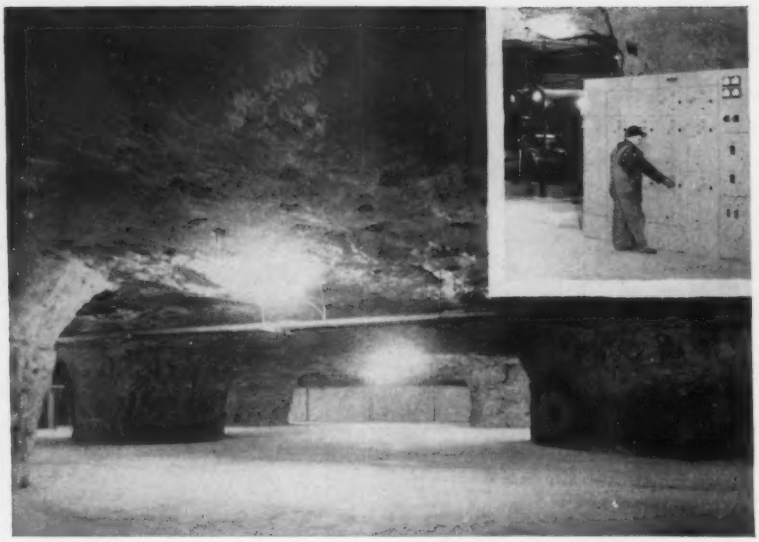
Baffles surrounding heating elements and the grille face of this unit converts radiant heat output to convected heat. Made in 10 sizes, from 1,200 to 8,000 w in Ion control or standard models.

Circuit Reclosers

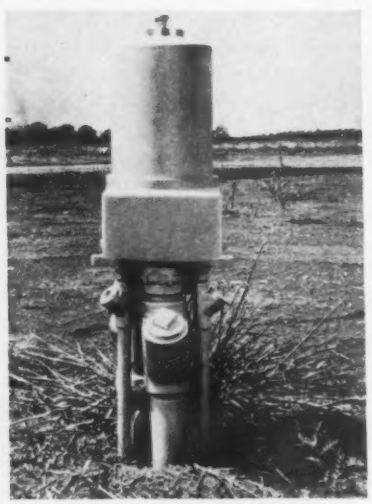
(3) Line Material Co., 700 W. Michigan St., Milwaukee 1, Wis.

Kyle type R oil circuit reclosers are now available with a continuous rating of 400 amp. This extends the application possibilities of the circuit interrupters, and provides a broader selection of continuous current ratings, the manufacturer reports.

Modern material handling methods are figured into the crating of Allis-Chalmers transformers. The crates are built around a pallet base that serves first as the bottom of the crate, and then as a pallet for the customer's general warehousing operations. In the pictures here you see transformers being unloaded at Portland General Electric's service center, which has a truck-bed-high loading dock. The small picture shows the pallet in use for other items after the transformer is removed. Claude Warren, who is in charge of PGE's transformer shop, says the new packaging method saves his company $3 to $5 just in the reuse of crate bottoms as pallets, and more in handling time



This unusual (first in the U. S.) underground freezer has 9½ miles of General Electric's White rigid steel conduit to carry cables from an aboveground substation down through 70 ft of solid stone to the distribution load center (inset). The huge freezer boasts 300,000 sq ft of storage space, all carved out of solid limestone in what was once a quarry. It was built by Inland Cold Storage Co. to facilitate west-east food shipments



Aboveground Condulets

(4) Crouse-Hinds Co., Wolf & 7th North St., Syracuse 1, N. Y.

Designed to replace conventional belowground manholes, this new condulet is said to provide an inexpensive and convenient means for splicing main feeder cables and making branch taps. Also allows easy inspection. Two styles are available. One is a deep-domed condulet with flame-tight threaded fittings for hazardous locations, the second is raintight for ordinary locations. Both are available with or without terminal blocks.

Low-Voltage Switchgear

(5) I-T-E Circuit Breaker Co., 19th & Hamilton St., Philadelphia 30, Pa.

The 4,000-amp type KE circuit breaker of this manufacturer is now accommodated in a 36-in.-wide compartment because of recent design changes. The result is to provide breakers with interrupting ratings of 150,000 amp at 240 v, and also ratings of 100,000 amp at 480-600 v, in a small space. Breaker is in test position with compartment door closed.

Brunt Faultfinder

(6) Parr Mfg. Corp., 48 Hale St., Cranford, N. J.

This instrument is described by the manufacturer as a combination ground detector and fault locator for use on normally ungrounded power circuits while the circuits are energized. Can be used on voltages from 120 to 600 v. Has audible pulsating signal.

BX Armored Cable

(7) General Electric Co., Wire and Cable Department, Bridgeport 2, Conn.

Individual conductors in this new cable have thermoplastic insulation, which provides color coding and makes stripping quicker and easier.

Supervisory Control System

(8) Motorola Communications & Electronics Inc., 4501 W. Augusta Blvd., Chicago 51, Ill.

This company announces a new supervisory control system for power stations and other applications. The new system, available in 25 and 50 point capacities, is designed to permit serving many remote stations economically, according to the manufacturer. A special optional feature is the increment control that permits degrees of "open" rather than the two-position "open-close" control. A 25-point system is housed in one case; 50 point in two.

Air-Cooled Condensers

(9) Frigidaire Division, General Motors Corp., Dayton 1, Ohio

New air-cooled condensers offered by this company are available in two, three and five ton capacities. They are for use in conjunction with self-contained air conditioning equipment or commercial refrigeration products. Condensing units without compressor are also available. They are designed for outside installation. Third product in the new line is for operation with conventional heating systems. It is an air flow cooling coil for both vertical and horizontal air flow.

Plug-In Bus Duct

(10) Federal Pacific Electric Co., 50 Paris St., Newark 5, N. J.

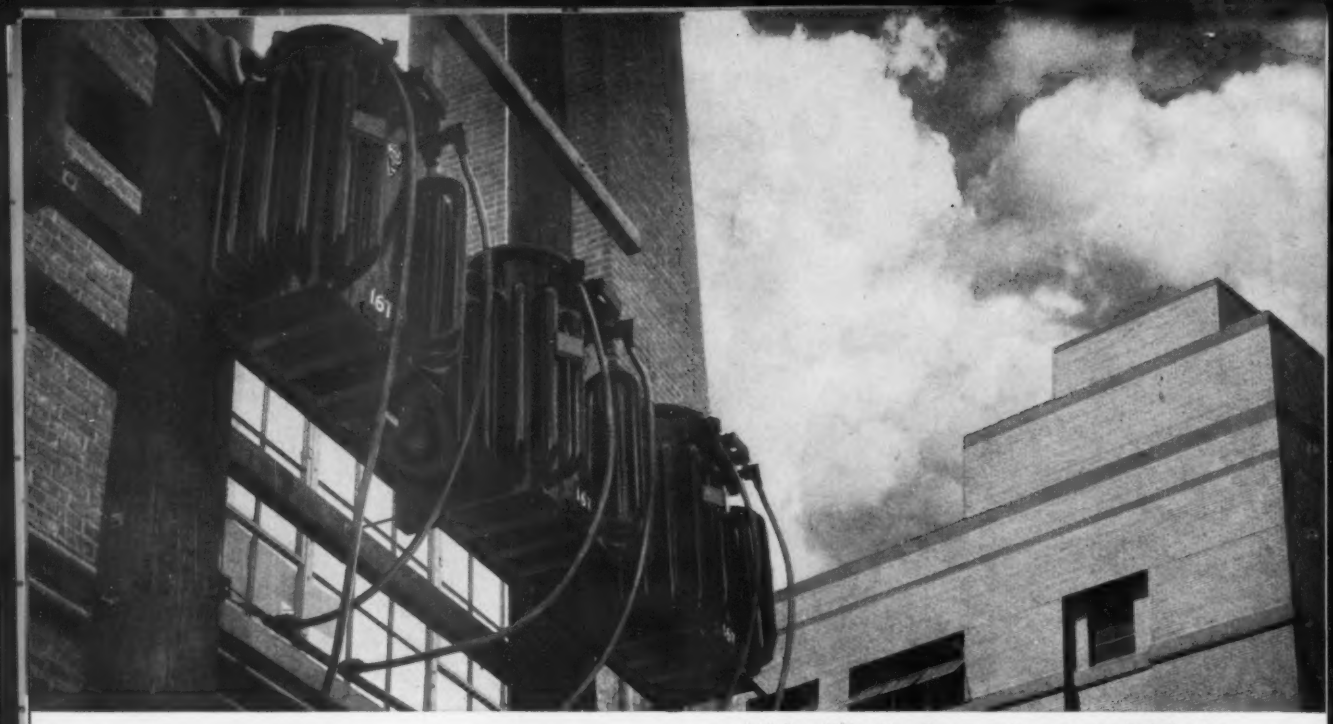
A new design of insulator for plug-in bus duct for heavy-duty commercial and industrial electrical distribution is said to withstand fault currents of 50,000 rms amp.

(New Products Continued p 50)

. . . powerful protection!

More and more major refineries and pipe line companies are using SIMPLEX CATHODIC PROTECTION CABLES to equalize voltage potentials between metallic structures and the earth. Polyethylene-or Anhydrex-insulated, these cables have good resistance to water absorption, excellent electrical properties and high resistance to deterioration. They are not affected by the usual acid or alkali conditions found in the earth.

SIMPLEX WIRE & CABLE CO.
79 Sidney Street
Cambridge 39, Mass.



L-M's Round-Wound transformers provide more capacity for heavier short-time overload without sacrifice in transformer life. Because L-M's obround design is lighter, smaller, and has less bending moment than round tank design, three 167's can be hung on a two-pole structure in place of three 100 kva transformers of older design.

For Heavier Commercial Loading

Why L-M Round-Wound® Transformers

Core-type construction with cruciform cross-section core and round coils provides the most efficient design for lower hot-spot gradient, greater capacity for short-time overload.

By **ROBERT P. THOMPSON**
Manager of Engineering
Transformers
Line Material Company

One of the primary factors that limit the overload capacity of a transformer is the efficiency with which heat from the coils can be dissipated into the transformer oil. Particular care was taken, therefore, in the design of L-M Round-Wound transformers, to assure greatest exposure of coil surface area to cooling oil, and least obstruction to oil circulation.

Cruciform Cross-Section Core

The core is wound of a continuous strip of oriented steel, of varying widths, to form a core of nearly round cruciform cross section. The cruciform cross section of the core provides natural oil passages for cooling between core and coils.

Natural oil passages between cruciform core and round coil help to dissipate the heat from the coils more rapidly. In addition, ducts between windings and between layers in most sizes provide additional oil circulation.

Round Coils and Cooling Ducts

L-M's long round coils expose a relatively large and highly efficient area to cooling oil. Because of this, they provide greater overload capacity than rectangular coil types. In addition, ducts are provided for oil passages between windings and between layers in most sizes, giving exceptionally uniform cooling for the coils.

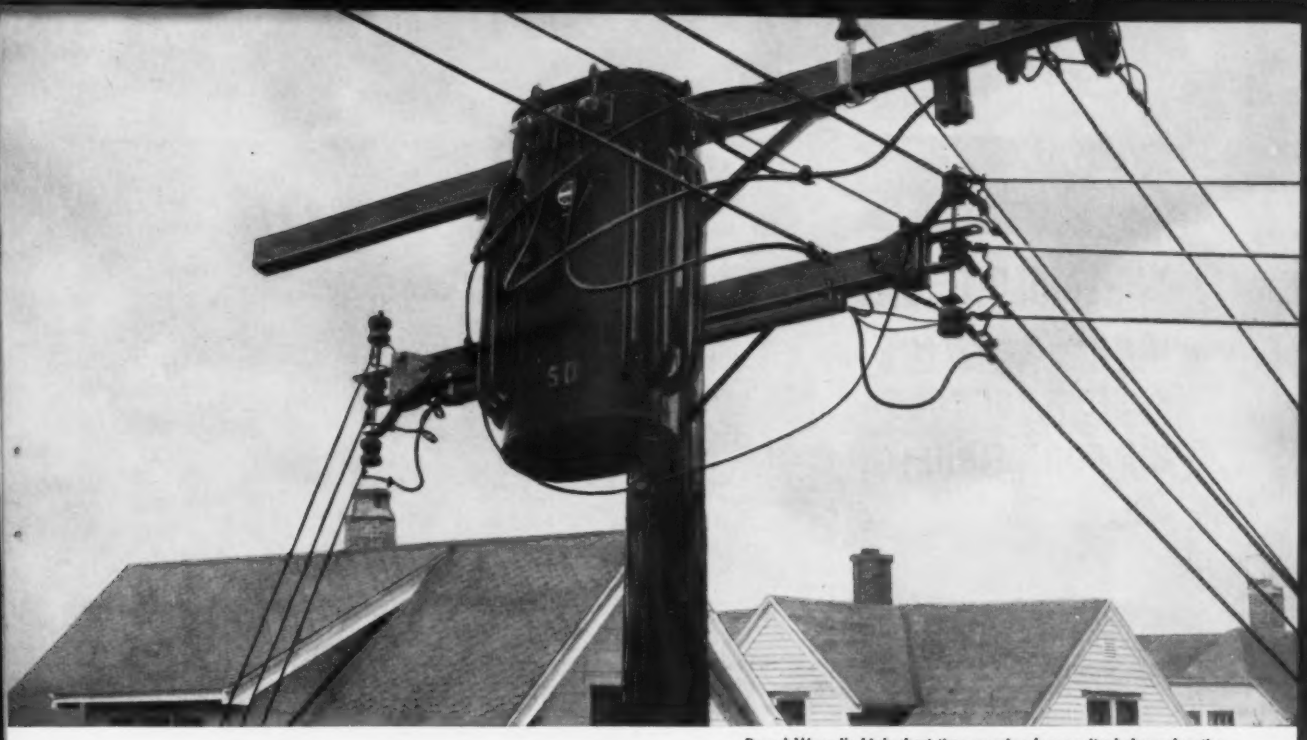
Core-Type Construction

In comparison with shell-type construction, L-M's core-type Round-Wound transformer has greater outer coil surface exposed to cooling oil; therefore coils are cooled more rapidly and uniformly. The cooling surfaces of shell types are partly blanketed by core steel; oil circulation is more obstructed.

Lower Hot-Spot Temperature, Higher Overload Capacity

Because L-M's Round-Wound design provides more efficient dissipation of heat from the coils to the oil, it has appreciably lower hot-spot temperatures during overload. This permits higher short-time overload, or longer overload periods, or greatly increased over-all life of the transformer.

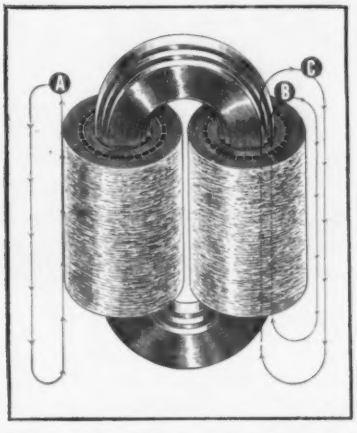
LINE MATERIAL
A McGRAW ELECTRIC COMPANY DIVISION



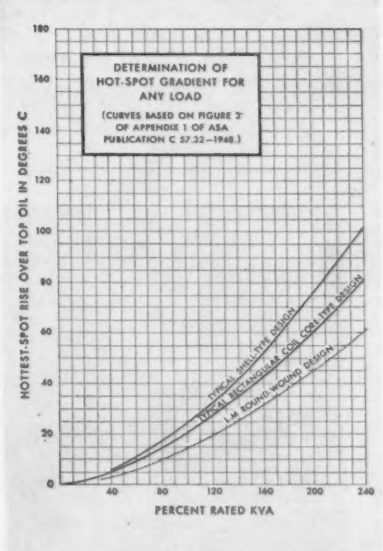
Round-Wound's high short-time overload capacity helps solve the more difficult summer overload problems in residential areas. The efficient cooling system in L-M transformers keeps hot-spot temperatures lower under high short-time overloads, increasing the capacity for overload and reducing the possibility of insulation damage.

For Heavier Residential Loading

Have Higher Overload Capacity



Because L-M transformers expose large, unobstructed areas to cooling oil on the outside of the coil (A), between core and coil (B), and between windings and layers (C), heat is dissipated into oil more rapidly and uniformly during overloads.



The higher the gradient at rated load, the more rapid is the rate of increase in the gradient with overload. Note that L-M's Round-Wound transformer, with a lower temperature differential (gradient) between hot-spot and top oil at rated load, has a greater capacity for overload.

Get Complete Information

Ask your L-M Field Engineer for complete information on L-M's Round-Wound design, and bulletins. Or write Mr. Thompson at Line Material Company, Transformer Division, Zanesville, Ohio.

Transformers

250

Five Reasons Why More Customers Are Selecting L-M Round-Wound Transformers

1. Higher Uniform Impulse Level: Round coils are *wound* into shape. Therefore insulation is not damaged by malleting into rectangular shape. Coils have longer creepage distance between windings and between leads.

2. Higher Short-Circuit Strength: Round coils are not stressed out of shape under high radial short-circuit forces. Strong steel frame, heavy clamping bolts, sturdy maple blocks and varnished coils prevent axial movement.

3. Higher Short-Time Overload Capacity: Round coils and the cruciform cross-section core expose large surfaces to cooling oil. The result is relatively low hot-spot temperatures, which add considerably to high short-time overload capacity.

4. Balanced Performance: The core is a continuous wound strip of oriented steel. Coils are wound directly onto this core. Since the core is not cut, unwound, or disturbed in any way after annealing, there are no air gaps to break up the flux path. This results in low exciting current and core loss.

The wound-core, round-coil design permits fewer winding turns and smaller turn diameter. This results in low impedance, and provides better regulation at all power factors.

5. Additional Capacity on Pole: L-M's new obround tank design makes the unit smaller and lighter, with shorter moment arm from the pole. This combination reduces the bending moment on the pole and crossarms, and thus greatly increases the potential capacity of existing transformer structures.

Mr. Contractor . . .
How much of this BIG MARKET are you getting?

WIREMOLD is the *modern wiring system* for room air conditioners

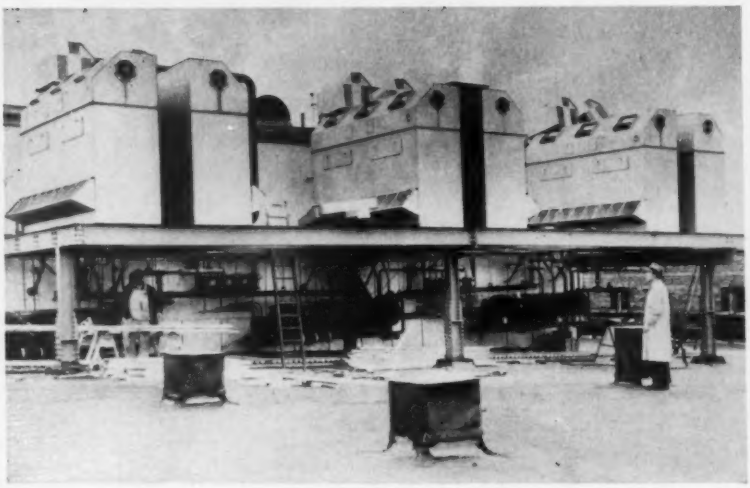
The wiring system in the **Elton Hotel in Waterbury, Connecticut,** was modernized with Wiremold 3000 raceway neatly installed in corridors, and Wiremold 200 carrying power into each room. The entire installation was completed without inconvenience to guests.

There's *Big Business* for you in electrical wiring for room air conditioners. Hotels, office buildings, apartments, and homes all over the United States are rewiring for this *main reason.*

Wiremold shows you how to *better your profits* because not only is it easier and faster to install, but with Wiremold you can pre-plan and cost-control *every* wiring and rewiring job. Wiremold *eliminates* tearing out walls or floors and unseen problems.

For further information write Dept. L-7

THE WIREMOLD COMPANY
HARTFORD 10, CONNECTICUT



A well-known refrigeration technique—compound compression—teamed with heat pumps, is in two large year-round air conditioning systems recently installed by York Corp. Use of the principle allowed application of the heat idea without the use of well or sea water or supplementary heating. First two applications are in the Heironimus Department Store, Roanoke, Va., and the Ballinger Building in Philadelphia, a new structure

Suspension Insulator

(11) General Electric Co., Insulator Department, Box 57, Baltimore 3, Md.

Extremely high mechanical strength and small size are combined in this new suspension insulator. No larger than an ASA standard insulator rated at 25,000 lb, the new unit is rated for 36,000 lb. The manufacturer predicts that single insulators of the new type can be applied where two are presently required.

This mobile street lighting demonstration unit of Line Material Co. can show how the company's fixtures will look on a city's streets. The unit is being scheduled to go where it is needed in the nation as requested by customers. It has luminaires, supports, standard, gas-driven 120-v generator

Hydraulic Aerial Beam

(12) Powers-American Division, McCabe-Powers Auto Body Co., 5900 N. Broadway, St. Louis 15, Mo.

A second model of this company's hydraulic aerial beam has the ability to carry a workman over, under or around obstacles in an insulated enclosure. Flexibility of the new lift comes from a pair of independently operated beams installed on a rotating mast. The outer beam can be moved to any point in an arc of 270° and the inner beam to any point in a 115° arc. Each is moved with a double-acting hydraulic cylinder. The supporting mast can be rotated continuously in either direction. Can have power take-off or independent drive.

Communication Cabinet

(13) General Electric Co., Electronics Park, Syracuse, N.Y.

A communications equipment cabinet announced by this company will house transmitter, receiver and power supply chassis for two-way radio, and is designed to be placed next to an office desk. Operating controls are about the same height as a top desk drawer. Will accommodate any standard 19-in.-long chassis operating in any mobile frequency range.

Splicing Tool

(14) A. B. Chance Co., Centralia, Mo.

This hot-line tool is designed to apply the company's Nico-Press sleeve splices. Available in 4- and 6-ft lengths, the poles are tested to 75,000 v per foot for safety purposes, the manufacturer reports. Pole is covered with a clear, tough plastic to prevent damage.

Revere
ELECTRIC MFG. CO. CHICAGO, U.S.A.
LIGHTING EQUIPMENT
The Standard of Comparison... with Quality Buyers Everywhere!
No. 4200 750 to 1500 W. Enclosed Flood
Famous Revere Elliptor Open-Type
750 to 1500 W. Rear Service Floods
Roof and Wall Brackets for Store Front Lighting
STAR-LUX Mercury Luminaire
ENDOVAL Mercury Luminaire
Single and Double Obstruction Lights
7100 Series 150 to 1000 W. Open and Enclosed Floods
Searchlights for Hand or Pilot House Control
Mercury or Incandescent Area Lighters
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Continuous Channel 15° Horizontal Fluorescent Luminaires
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1, 2 or 3 Arm Poles for Gas Station Lighting
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REVERE ELECTRIC MANUFACTURING CO.
6009-17 BROADWAY • CHICAGO 40, ILL.
Available in Canada thru Curtis Lighting Ltd., Leaside, Ont.

B-M INDENTER TYPE FITTINGS FOR E.M.T.

Concrete-tight

Red Throat
Insulated Connector

Red Throat
Cross section

Briegel, the Original Indenter Fittings are neater in appearance, easier and faster to use. Installation is simple and less expensive. Two quick squeezes sets them forever. Try B-M Indenter Fittings and get more profits from each job.

All B-M Indenter Fittings are U.L. Approved as concrete-tight and for general use (File Card E10863). Also comply With Federal Specifications W-F-406.

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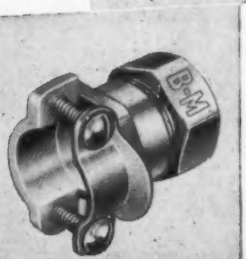
B-M COMPRESSION TYPE FITTINGS
FOR E.M.T. Rain-tight

SIZES FROM ½" to 2"

SIZES FROM ½" to 2"

SIZES ½" ¾" 1"

SIZES ½" ¾" 1" 1¼"



SIZE ½"

BRIEGEL METHOD TOOL CO.
GALVA • ILLINOIS

Wire Coil Racks

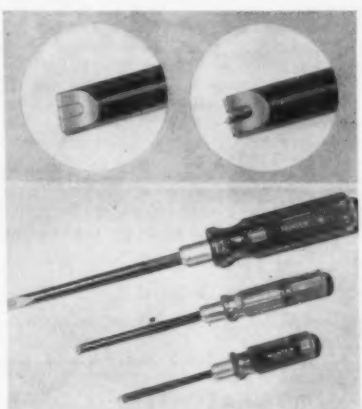
(15) Jarke Mfg. Co., 5407 N. Broadway, Chicago 40, Ill.

Durable, one-piece racks for storage of wire coils developed by this company are said to greatly reduce warehouse space requirements. Designed to permit fork lift entrance from all sides, and fitted at the corners for easy, safe stacking. Capacity of each rack is 4,000 lb.

Mobile Radiophone

(16) Motorola Communications & Electroncis Inc., Technical Information Center, 4501 W. Augusta Blvd., Chicago 51, Ill.

An entirely new circuitry is utilized to provide private, interference-free mobile communications with this new radio. Operators hear only their own calls. Subcarrier tone is inaudible and squelch adjustments are eliminated.



Nonslip Screwdriver

(17) H. D. Hunter & Co., 3499 E. 14th, Los Angeles, Calif.

An inner blade that turns to lock against the sides of screw slots is a nonslipping feature of these new screwdrivers. Inner blade turns as handle is turned by operator.

Crossarm Brace Bolt

(18) Hubbard & Co., 6301 Butler St., Pittsburgh 1, Pa.

Bolt head and washer are combined in one piece in this new bolt for crossarm brace attachment, to provide wrench holds at both ends of the bolt. The built-in washer has more surface area than a standard carriage bolt head. The bolt is ⅜x4½ in. under the head, with a 1¼-in. thread.

Concrete Hole Saw

(19) J. F. Hamlin Co., 746 Ellis St., San Francisco 9, Calif.

Diamond-faced core drills and a constant-pressure feed mechanism greatly increase simplicity of operation of this new electric- or gas-powered core cutter for concrete, the manufacturer reports. Will cut holes from 1 to 6 in. diameter through most materials. Here it is cutting a 4-in. hole through marble-faced reinforced concrete.

This battery-operated blinker light was designed by the testing department of Portland General Electric Co. at the suggestion of Lloyd Smith, supervisor of tree service. The amber light flashes on and off at the rate of 120 blinks a minute and batteries will last for well over 200 hours. The battery is a 6-v Hotshot. The 45-in.-high signal is designed to be at driver's eye level at 1,000 ft. Support leg folds up when not in use

For more data fill in coupon on page 54

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AUDIBLE
SIGNALS
that are
EASIER to INSTALL

Faraday Uni-Pact
1. Wire to safe, dead-front adapter plate from any 4" outlet box, Wiremould or Conduit.
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... and give amazing
Flexibility, too!

12 different sound instruments all fit one adapter plate

Handle signal systems? Here's why it will pay you to feature Faraday Uni-Pact:

Easier to install — you make more profit on each installation.
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Virtually damage-proof—sound instruments go on after rough-in men are finished.
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Annunciators • Synchronous Clocks • Door Openers • Fire Alarms • Transformers • Electric Clock Systems • Contact Devices • Freezer Alarms • Sirens • Plug-master Cord Sets.

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Engineers in Sound and Sight Since 1875
ADRIAN, MICHIGAN

BULLETINS ETC.

(20) DISTRIBUTION TRANSFORMERS—Construction, manufacturing methods and packaging of Kuhlman distribution transformers, 167 kva and below, are described in bulletin CS-201. Write to Advertising Department, Kuhlman Electric Co., Bay City, Mich.

(21) CABLE SUPPORTS—T. J. Cope Inc., 711 S. 50th St., Philadelphia 43, Pa., has published two bulletins, 255 and 67A, and one catalog, devoted to their cable trough, conduit, pipe and other products. Carries illustrations and data on equipment and accessories.

(22) TUBING DATA — A new technical data folder concerning use of tubing at elevated temperatures is available from Tubular Products Division, Babcock & Wilcox Co., Beaver Falls, Pa. Folder is designated TDC-154A.

(23) AIR CONDITIONING — Eighteen different ways to install self-contained central system air conditioners are described in a new manual by Amana Refrigeration Inc., Amana, Iowa. Drawings, diagrams and text are useful to architects, builders and contractors who need ideas for installation in a variety of locations in the home or commercial buildings.

(24) RURAL SERVICE TRANSFORMERS—Electrical and mechanical features of Allis-Chalmers redesigned distribution transformers for rural service are described in bulletin 61B6726B. Address is 939 S. 70th St., Milwaukee, Wis. Conventional and self-protecting types are described.

(25) POLE LINE HARDWARE—Bulletin P256 of Hubbard & Co., 6301 Butler St., Pittsburgh 1, Pa., is a large reference chart showing 60 different pole line hardware items in their respective positions on a pole. Suitable for either hanging on a wall or folding into an 8½x11 file folder.

(26) SWITCHES—Technical publication 5604 of the Delta-Star Electric Division, H. K. Porter Co., covers a newly designed line of PMB-40 horizontal side-break, braidless, group-operated switches. Tables provide technical data, weight and dimensions. The switches are rated from 7.2 to 161 kv in current ratings of 400, 600 and 1,200 amp. Address is 2437 W. Fulton St., Chicago 12, Ill.

(27) CONVENIENCE OUTLETS — "The Modern Way to Provide Convenience Outlets Unlimited" is the title of Wiremold Co.'s new circular on its complete line of Plugmold systems. Write to the company at Hartford 10, Conn.; ask for Form 589.

(28) ROOF MASTS—Hubbard low roof service mast kits are described in Bulletin P-1255, Hubbard & Co., 6301 Butler St., Pittsburgh 1, Pa.

(29) AIR CLEANER — The Precipitron electronic air cleaner for commercial and industrial applications is described in B-1425 offered by Westinghouse Sturtevant Division, Dept. T-079, 200 Readville St., Hyde Park, Boston 36, Mass.

(30) SMOKE DENSITY INDICATOR—Details of smoke density indicator system FE-3 of Electronics Corporation of America, Combustion Control Division, are carried in a recent bulletin. Illustrated with photos and drawings. Write to the company at Dept. CN-4, 718 Beacon St., Boston 15, Mass.

KILL TWO BIRDS WITH ONE STONE — Fill out this coupon and get back valuable information from as many sources as you indicate.

ELECTRICAL WEST *Not good*
68 Post St., San Francisco 4, Calif. *after September 1*

Please send me, without obligation, the new product information or catalogs:

If described in Product News, circle item number

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

If described in advertising, fill in page number

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NAME..... TITLE.....

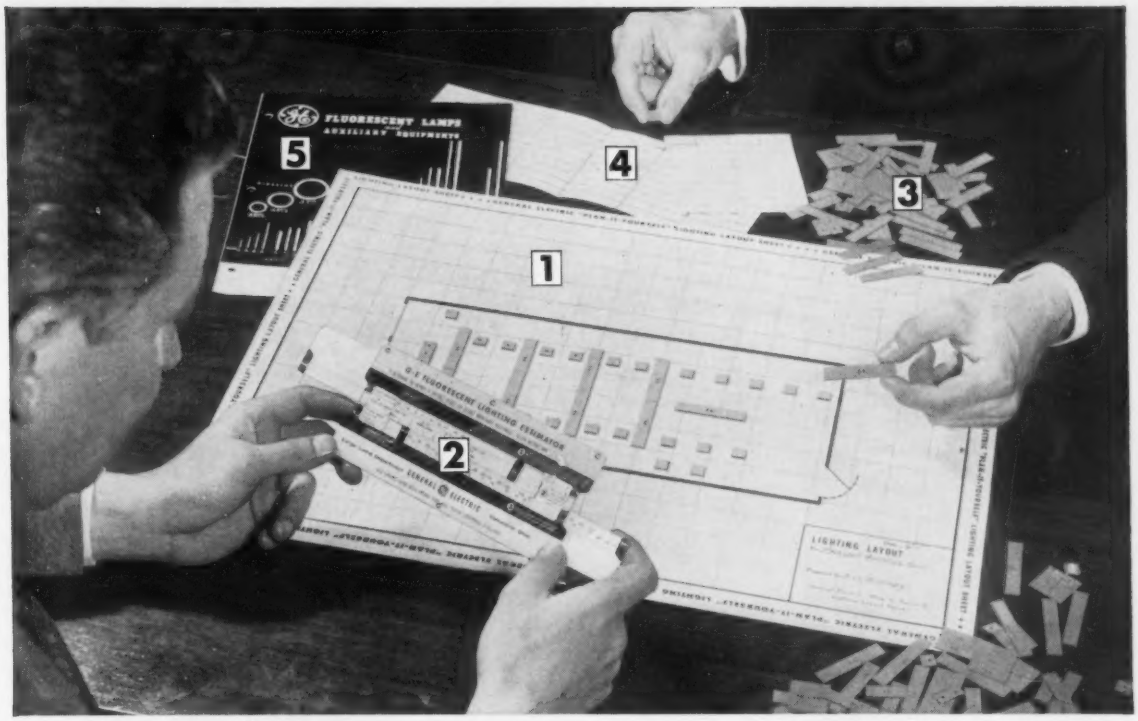
COMPANY.....

ADDRESS.....

CITY..... ZONE..... STATE.....

* Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.

GENERAL ELECTRIC ANNOUNCES A NEW LAYOUT KIT TO MAKE YOUR LIGHTING JOBS EASIER TO SELL!



Your General Electric "Plan-It-Yourself" Lighting Layout Kit contains (1) layout sheets, (2) a fluorescent lighting estimator, (3) movable, scaled "fixtures", (4) gummed "fixtures" for your permanent layout, and (5) a lighting design guide.

Send for your new G-E "Plan-It-Yourself" Lighting Layout Kit today. It will help your lighting prospects sell themselves.

The G-E "Plan-It-Yourself" Lighting Layout Kit is a brand new idea that makes your selling more profitable because:

1. It makes your selling easier. Your prospect helps sell himself because he is in on the planning. He can visualize his lighting needs more easily.

2. You can "sell up". Because your prospect sees *why* the new layout fits his needs, you can sell him a better lighting job. *You make more profit!*

3. You'll "close" more sales. Once the layout is complete, your prospect okays it. Your sale is half closed even before a complete cost estimate is made.

4. Order your sales-building "Plan-It-Yourself" Lighting Layout Kit Today! Use it to make your next lighting job more profitable—more fun! Costs only $1.75—contains enough material for a dozen lighting jobs. **Mail the coupon below,** or see your G-E lamp supplier.

TO: General Electric, Large Lamp Dept., WE-7,
Nela Park, Cleveland 12, Ohio.

Gentlemen:

Please send me _____ new G-E "Plan-It-Yourself" Lighting Layout Kits @ $1.75 per kit. I enclose $_____.

SEND TO:_____
(Please Print)

COMPANY_____

STREET_____

CITY_____ ZONE_____ STATE_____

Progress Is Our Most Important Product

GENERAL ELECTRIC

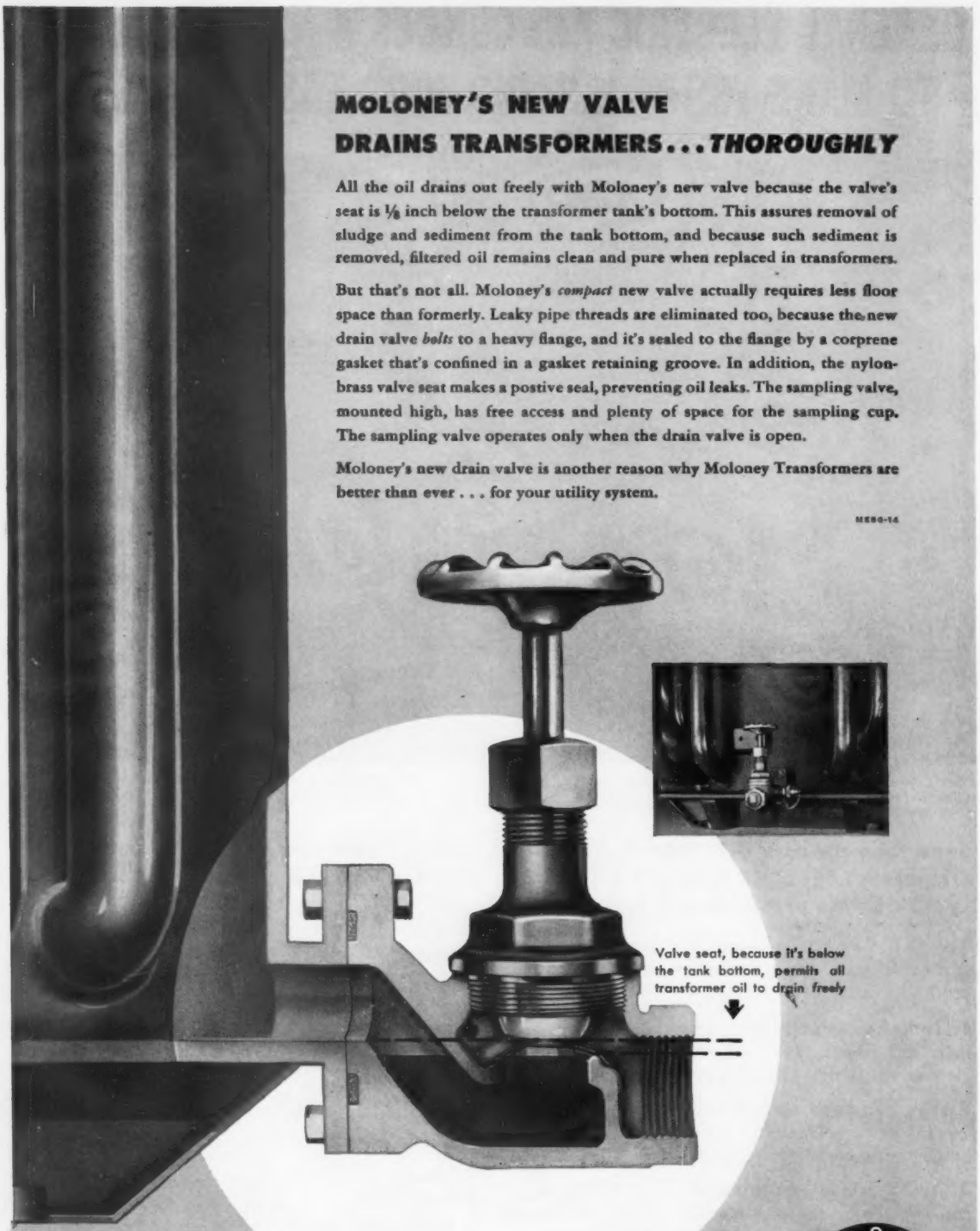
MOLONEY'S NEW VALVE DRAINS TRANSFORMERS...*THOROUGHLY*

All the oil drains out freely with Moloney's new valve because the valve's seat is ⅛ inch below the transformer tank's bottom. This assures removal of sludge and sediment from the tank bottom, and because such sediment is removed, filtered oil remains clean and pure when replaced in transformers.

But that's not all. Moloney's *compact* new valve actually requires less floor space than formerly. Leaky pipe threads are eliminated too, because the new drain valve *bolts* to a heavy flange, and it's sealed to the flange by a corprene gasket that's confined in a gasket retaining groove. In addition, the nylon-brass valve seat makes a postive seal, preventing oil leaks. The sampling valve, mounted high, has free access and plenty of space for the sampling cup. The sampling valve operates only when the drain valve is open.

Moloney's new drain valve is another reason why Moloney Transformers are better than ever . . . for your utility system.

ME86-14



MOLONEY ELECTRIC COMPANY

Power Transformers • Distribution Transformers • Load Tap Changing Transformers • Regulating Transformers • Step Voltage Regulators • Primary Unit Substations • Secondary Unit Substation Transformers • Network Transformers • Series Street Lighting Transformers • Subway Transformers Industrial Dry Type Transformers • Capacitors • Magnetic Components For Electronics

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

ELECTRICAL WEST Contractors' News Letter

QUICK NEWS ON TRENDS, LAWS, CODES, MATERIALS, EQUIPMENT, COSTS, WAGES, ETC.

Bid beefs

Everybody is complaining about the bids being made by the other guy these days but nobody seems to apply it to himself, the only place where correction can start. This applies both to contractors and distributors. Every contractor meeting is bitter with talk about it. The national convention of National Association of Electrical Distributors heard it from almost every speaker. Prediction: It will be in all the speeches and bull sessions at the National Electrical Contractors Assn. convention in San Francisco, Sept. 24-29. Added prediction: It will be talk.

Contained

Contractors and distributors are caught in a jungle of conflicting pressures, including the primal law—survival of the fittest. Laws, codes, regulations don't help for it has become fashionable to circumvent laws and rules. Change of administration won't help either. All that can do is to take more out of one pocket to put some into other pockets, keeping a goodly brokerage for itself for the transfer.

Costs will rise more

Let's face it—all costs are going up. Led by the electrical contractors themselves by their generous increases in wage scales, all construction steel, copper, transportation scales are going up. In short time this will mean higher prices for wiring materials, delivery, etc. Even the gigantic road building program will raise the taxes on gas and tires. Fear of a strike has made wage increases a pushover. Yet the strike that managements have more to fear could be a buyers' strike.

Counter attack

The heavy artillery is pounding away at that (sales) resistance. The Live Better . . . Electrically and Housepower commercials, the Operation Home Improvement ads are just beginning to reach into the public's thoughts to stimulate them to action. Organization to take care of any inquiries these promotions generate are being formed, others talked about. In Cincinnati a group of contractors have set up a Housepower home wiring company. Kansas City is instituting a special two-year house wiring apprenticeship to train men a lost art of home rewiring. Oakland NECA chapter plans a meeting July 16 of interested contractors to set up a means of following up and selling leads that may develop.

Despite themselves

Joint industry committees, supported usually by a 2c an hour fringe on the wage rate, are a new method for getting contractors to finance some sales and promotional activity. Fresno has it in its wage agreement. It was discussed at the June meeting of the California Conference of NECA Chapters in that city. Nineteen boards were reported in existence in the east. The Arizona Chapter is said to have one. Another is being set up in Stockton, Calif., and is being discussed in San Jose.

Recruiting

Shortage of manpower is so acute for electrical work in Los Angeles that the Los Angeles Chapter and IBEW have agreed to advertise in the papers for wiremen. They report to the State Employment Service from where they are sent to the union for clearance.

Progress report

Certified lighting jobs numbered 49 by the end of July. Ward Schafer, Northern California Electrical Bureau representative working on this program, reported. The program is really beginning to roll now, he said, and with a contest for contractors soon to be initiated results from the training schools and the selling effort will soon be much in evidence.

Heavy going

Still no action on the federal construction bill, S-1644, in the House of Congress at press time. Having surmounted the Senate and finally the judiciary committee of the House, it was now in the hands of the House rules committee to be scheduled for floor action. The bill has been fought for by the NECA and group of mechanical specialty contractors' associations. It has been opposed by the AGC and governmental officials.

October will be fixture month, it was announced by the NAED Atlantic City convention and will be sponsored by the American Home Lighting Institute and 300 electric utilities. The cooperation of 2,000 electrical distributors has been promised to make it a selling event for residential lighting fixtures. An 8-page booklet, "Here's How," is available with plans for capitalizing on it. **The month for it**

San Diego certainly will sparkle the month between July 18 and Aug. 19, the time of the Fiesta Del Pacifico. Bureau of Home Appliances is telling all San Diegans to dig out their Christmas lighting sets and decorate the fronts of their homes with the tiny colored lamps to welcome the thousands of visitors expected during the month of special events and activities. Distributors are being alerted to stock up on Christmas lighting sets . . . A special meeting of the Electrical Contractors Division was scheduled for Escondido June 27. **Brilliant idea**

Salt Lake City ordinance now requires a minimum standard installation of 1¼-in. conduit or EMT on all service entrances for residences of 1,499 sq ft or less, with No. 2 conductors and panels of 20 circuit capacity. For residences of more than 1,500 sq ft, 1½-in. conduit or EMT and No. 1/0 conductors and a 30-circuit-capacity panel are required. Convenience outlets are to be 12-ft centers with two 20-amp kitchen receptacle circuits and at least two spare circuits in the panel required. A range circuit and receptacle are standard for all residences. This became effective June 1. **Adequacy ruled**

Policy regarding 480-v distribution for buildings has been clarified by Pacific Gas and Electric Co. in a letter to its contractors. PG and E, it says, will now supply three-phase, four-wire, 265/460-v star-connected service in all areas served by the company, provided the demand to be supplied to a single customer at a single delivery point is not less than 1,200 kva as determined by the company. If, in a network secondary distribution area, such service is supplied to a new building, service at other voltages will not thereafter be supplied to the same building. **Yes, it can be had**

Vancouver Electrical Assn., a contractors' group, elected S. C. Murkin as its president for 1956-57 term. E. Van Balkom is vice-president, Fred Moore secretary, N. V. Beech treasurer. **Elected**

Among people—LeRoy Bennett, retired manager of Northern California Electrical Bureau, will head up Operation Home Improvement program for the Oakland area, representing the Chamber of Commerce of that city . . . George Gough has been appointed Inland Empire Electrical League field representative . . . Carleton Thompson, San Diego Gas & Electric Co., was elected regional vice-president for the IES South Pacific region to succeed Prof. Dan Finch of the University of California, Berkeley . . . M. M. Hawkey, professional engineer, has established practice in Vancouver, B. C., as consultant design engineer for heating, plumbing and electrical work . . . Dick Schallich, Louis Electric Co., Salinas, has opened up a new lighting display room at 283 E. Alisal St. with the most complete fixture display in the valley . . . Joseph L. McGann, formerly with Biber Electric Co. 10 years, has been appointed assistant business representative for IBEW Local 617, San Mateo County . . . Roy H. Kreyser, lighting engineer, Department of Water & Power in Los Angeles, chairman of the Southern California Section, IES, is taking an advanced lighting training course in Nela Park, Cleveland . . . Sy Hughes, formerly with Sunbeam, is now with Smoot-Holman Co., Inglewood . . . Foster Sampson, consulting lighting and electrical engineer, moved to new offices at 1125 W. Sixth St., Los Angeles . . . Nat Blumberg, now Western sales manager for Lightolier Co., opened the new headquarters of the company in the Brack Shops Building on Seventh Street in Los Angeles . . . Fred Cooper is a new partner of Lloyd, Jones & Cooper, consulting engineers, Los Angeles . . . Robert Gordan, formerly with T. L. Rosenberg Co., Oakland, has joined the Leadlight Fixture Co. organization . . . Death took D. B. Adams, prominent Spokane electrical contractor, early in May. He was president of the Washington State Electrical Council and prominent member of the Inland Empire Chapter, NECA. **Had you heard**

Cable trough is acceptable to most inspectors and hence need not have any special section written into the 1956 National Electrical Code. A meeting was to have been called by T. J. Cope Inc., maker of a cable trough, to announce the acceptance of the trough by the 1956 code but in view of this opinion it was called off. Underwriters' Laboratories are testing the trough at the present time. **No one objects**

Has now arrived

Long left out in the cold, so to speak, electric heating is really being promoted nationally even in the northeastern states. General Electric Co. has announced a new electric radiant heating thermoplastic insulated cable for installation in plaster or laminated gypsum wallboard ceilings. Likewise, it offers a new electric baseboard heating unit. With it has been developed a "Design Manual for Electric Radiant Heating" showing methods of installation and computing the amount of cable necessary for a satisfactory job . . . NEMA even has established a house heating equipment section, which has issued an Electric Heating Manual and a slide film sales pitch.

To carry it on

Denver's Electric Modernization Bureau, after a six-month trial period, has been established as a permanent organization. At a membership meeting held June 12, Dale Strohminger, contractor, was elected president; Adrian De-Koning, vice-president; Meryl Mentzer, RMEL, secretary-treasurer; and directors are Paul DeSha, Leonard Van Wagenen, contractors, A. A. Roebke, PS of Colo., and Roy Kennedy, Kennedy-Peterson Electric. Roy Jussel continues as the salesman-estimator for the bureau.

Strip of outlets

A new continuous outlet wiring material is named Lectrolines. It is a continuous plastic molded strip, 1 x ¾ in. and in 10-ft lengths, in which outlets are spaced at 2-ft intervals. Made by Lectrolines Co., 157 W. 57th St., New York.

Housepower needed

FHA reported millions of insured loans on homes for property improvement but its breakdown shows that most of this was spent for painting, heating, plumbing, roofing, with no mention of wiring. Was the amount too small to tabulate?

Coming meetings

Two big events in Los Angeles—The annual Western Electronics Show and Convention, combining the West Coast Electronic Manufacturers Assn., Los Angeles and San Francisco Sections, and the Institute of Radio Engineers, will be held Aug. 21-24 in Los Angeles . . . The American Society for Testing Materials will hold its second Pacific Area national meeting in Los Angeles Sept. 16-22 at the Statler Hotel.

On the faculty

Dan Finch, University of California, was listed on the tentative program for a light and vision symposium to be held at Cornell University Sept. 11-14, prior to the national technical conference of the Illuminating Engineers Society in Boston, Sept. 17-20. Finch will discuss his contrast threshold meter in street lighting.

Charge batteries

Wiring and Housepower will play a predominant role in the program of the International Association of Electric Leagues' annual conference in Detroit Oct. 3-6. On the program committee for the West are J. R. Dooley of Electric Service League of B. C., Vancouver, W. H. Johnson of Appliance Merchandisers Assn., Phoenix. Reports will be heard on the national Electrical Week, the electrical industry coordinating group, the Housepower program, the National Adequate Wiring Bureau's activities. Several managers from Western leagues are planning to attend.

Get in line

To meet San Francisco Bay area's wage scales, the Vallejo-Solano branch of NECA and the union agreed to a step-up program of wage increases beginning with 10c July 1, 12½c Oct. 1, the anniversary date, and the remaining 10c Feb. 1, with a health-and-welfare advance to 10c on Jan. 1. This will bring the total to the $3.61 scale generally prevailing throughout the area.

Two codes

That copies of the rewritten National Electrical Code by Frank Thornton will also be published soon after the Sept. 1 date by which the 1956 edition of the code comes out was told to the Puget Sound Chapter, IAEI, by W. L. Gaffney, a member of the NFPA correlating committee. This will allow a period for comparison and cross reference . . . Gaffney also said that high heat or RHH wire has been accepted but because of the possible heating problem in panels and switches the correlating committee had agreed that Nos. 14, 12 and 10 Cu and 12, 10 and 8 Al would be assigned the same rating as RH copper. Modifications in the preliminary table of current carrying capacities for aluminum conductors, he said, are being made to reconcile the service entrance conductor situation. Uprating of 250-v receptacles to 277 v, however, was turned down.

Provincial meeting

Electrical Contractors Assn. of British Columbia holds its fifth annual conference at Chilliwack, B. C., July 27-28. Alex Howie, of that city, a member of the Upper Frazer Valley Electrical Contractors Assn., is new president of the B. C. association, succeeding Leon Irvine of Vernon, Central Okanagan association.

Farm prospects

National Farm Safety Week is July 22-28 and the Plumbing and Heating Industries Bureau suggests that it is a good time to sell electric water pumping for farm fire protection. Suggestion is made that the best way to wire the electric water system is to bring the power line to a center pole in the farmyard and distribute to the various outbuildings. The water system should be on a circuit by itself, separate from the other building wiring. When water is needed to fight fire, the pump should never be put out of operation by the burning of the wire system.

Complete line

Arrow-Hart & Hegeman Electric Co. has just issued a new complete line wiring device and enclosed switch catalog of 310 pages. A special section features the Quiette switches at the beginning of the catalog.

Roll up sleeves

The Electrical Contractors Division of the Electric League of Los Angeles elected new officers June 14. James H. Chatterton is chairman, Arthur F. Curtis vice-chairman, Roy O. Hinger Jr. treasurer, Jacob E. Sanders recording secretary and Raymond W. Tressler sergeant-at-arms. All these men are electrical contractors in Los Angeles. Eighty firms belong to the recently formed division, which will set up a program, membership and code committees and other activities.

New term

"Dust-Ignition-Proof" is a new term that has been introduced into the National Electrical Code through an interim amendment and will be incorporated in the 1956 edition. It relates to equipment used in electrical installations where arcs, sparks or heat otherwise generated or liberated might cause ignition of nearby accumulations or atmospheric suspensions of a specific dust. The amendment will be made to Art. 500 in the appropriate sections. Another official interpretation deals with seals for raceways in aircraft hangar installations.

What fees to pay

An informative and helpful booklet, giving the inspection fees for the cities of the San Francisco Bay peninsula, has just been issued by the Peninsula Electrical Contractors Assn. Inc., affiliated with the San Francisco association and NECA. W. J. Varley is executive manager of both. San Mateo County and cities are covered.

Rebellious

Still unhappy about the handling of the Herb Ufer presidency and other relations with the IAEI, the Southern California Chapter of electrical inspectors discussed the need for independence of the association from manufacturer support to keep it from being a "captive organization."

Range questions

Oregon inspectors will meet at Bend in August. Previous meeting was held at Eugene, Larry Sisson, chairman, presiding, and was attended by William Gaffney, Northwestern Section secretary-treasurer, from Tacoma and John Watts of Seattle. The problems of wiring built-in range components occupied most of the code discussion period, dissatisfaction being expressed that some manufacturers equipped such components with ⅜-in. flex and too small a wire. Design of luminous ceilings also was questioned because of placing lamps and ballasts too close to acoustical ceilings of flammable material, causing fires.

Back to water pipe

Grounding to water piping systems, a subject of controversy that reached the Public Utilities Commission of California, with water works people wanting it prohibited, was finally adjusted satisfactorily, it was reported by Ernest Nelson of San Leandro, who attended the hearing. This report was made to the Northern California Chapter meeting at Sunnyvale. Following code discussion, a tour of Westinghouse's Sunnyvale plant was made. The next meeting of the Northern California Chapter, IAEI, will be in Santa Rosa July 21.

Meets a need

A wireway has been developed by Ets-Hokin & Galvin, Oakland, for heavy conductor runs in industrial plants, substations, etc. It is UL listed, has bends and fittings, makes good ground continuity and saves costs.

NAED coming

Bill Meek, Westinghouse Electric Supply Co., Los Angeles, was elected Western regional vice-president of the National Association of Electrical Distributors at its annual convention in Atlantic City June 14. He is the chairman of the Pacific Zone of NAED. "The Golden Gate in '58" was given a rousing as well as an official endorsement as the Golden Anniversary Convention of the association will be held in San Francisco the week of June 8, 1958. The Western Region meeting will be combined with it, according to William Jewell, Pacific Zone manager. This year's zone convention will be held at the Westward Ho Hotel, Phoenix, September 30 to Oct. 3.

To better describe our service to the electric power industry, the LOCKE Department of General Electric has changed its name to—

Insulator Department General Electric Company

Baltimore, Maryland

In its sixty-four-year-old tradition as pioneer in the insulator field, the Insulator Department will continue to originate important insulator developments.

The trademark, LOCKE, will still be used in connection with General Electric insulator catalog numbers.

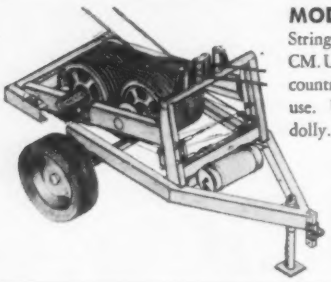
Progress Is Our Most Important Product

GENERAL ELECTRIC

Partial showing of the now ***COMPLETE*** line of...

PENGO TENSION WIRE STRINGING EQUIPMENT

Manufactured By PETERSEN ENGINEERING CO., Santa Clara, Calif.

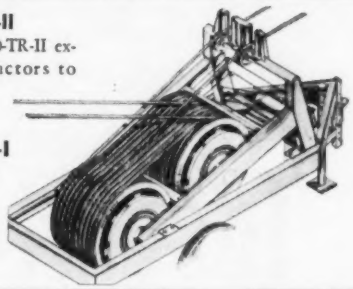


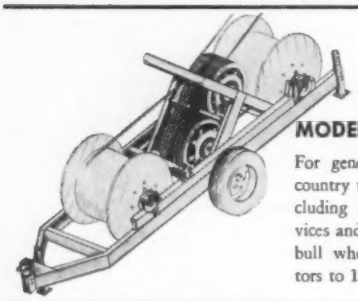
MODEL 5000-TR-II
Strings two conductors to 556,300 CM. Used primarily for very rough country work; also for general use. Use separate reel-carrying dolly.

MODEL 5000-TR-I
Similar except strings one conductor.

MODEL 6000-TR-II
Similar to Model 5000-TR-II except larger. Conductors to 1,272,000 CM.

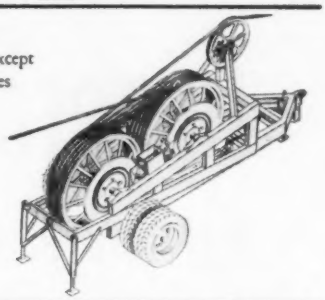
MODEL 6000-TR-I
Similar except for one conductor.

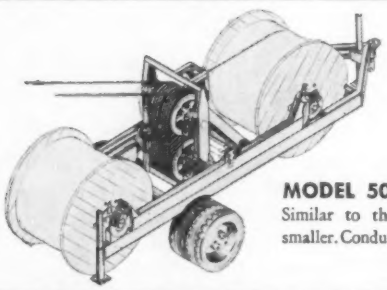




MODEL 6000-WS-TR
For general and medium rough country use. A complete unit including trailer, reel-carrying devices and its own double pair of bull wheels. Conductors to 1,272,000 CM.

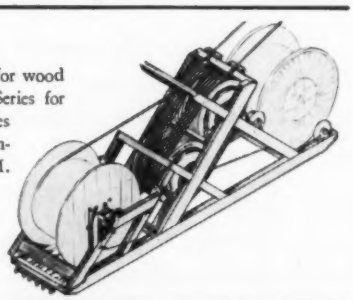
MODEL 7000-TR-I
Similar to model 6000-TR-I except larger. Conductors to 2 inches diameter.

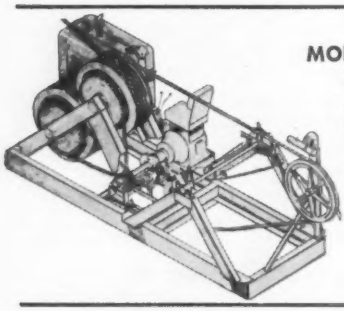




MODEL 5000-WS-TR
Similar to the 6000-WS-TR but smaller. Conductors to 556,300 CM.

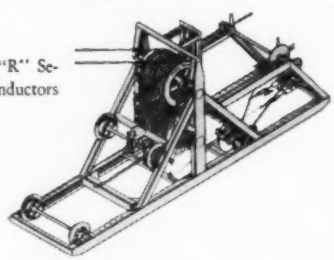
MODEL 6000-W
Available in "S" Series for wood or steel reels, in "R" Series for steel reels, or "SR" Series for trailer mounting. Conductors to 1,272,000 CM.

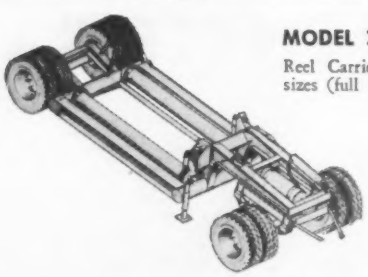




MODEL 6500
Bull Wheel Cable Puller. Available in "R" Series for steel reels, "S" Series for wood reels. Conductors to 1,272,000 CM. Also available in "LWR" Model for extra-large steel reels. Model 5500 similar (smaller).

MODEL 5000-SR
Available in "S" Series, "R" Series, or "SR" Series. Conductors to 556,300 CM.





MODEL 7500
Reel Carrier. Takes the largest sizes (full range) of steel reels. Loads and unloads with one man. No auxiliary equipment needed except the truck that pulls it. For use with any one of the tensioning machines shown on this page.

ADDITIONAL MODELS NOT SHOWN

Tension Reel Trailers

MODELS 2, 3, and 4, Two-Wheel Straddle Dollies not shown. For use with any one of the tensioning machines shown on these pages.

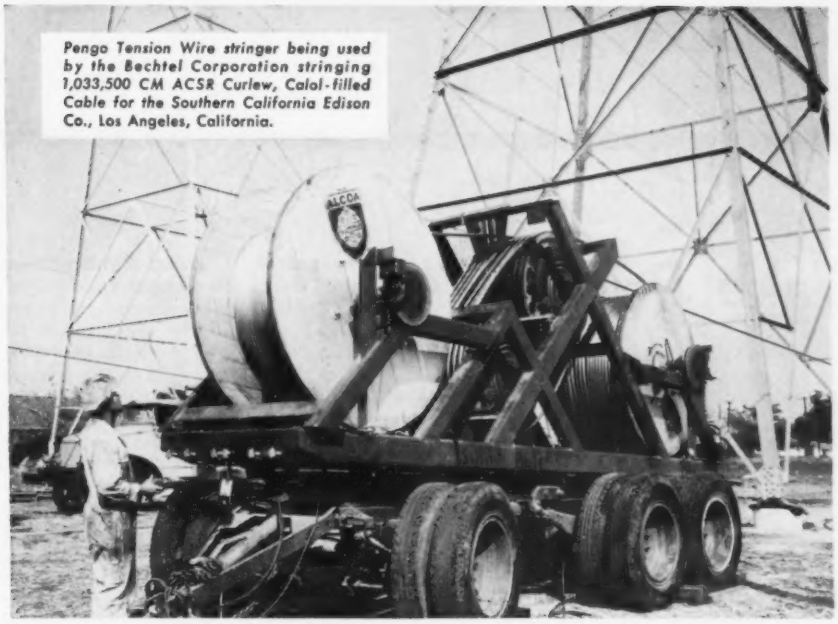
Tension Stringers

MODELS 6000-SK-I and 6000-SK-II For one or two conductors to 1,272,000 CM. Skid mounted for installation on owner's equipment.

MODELS 5000-SK-I and 5000-SK-II Skid mounted for installing on owner's equipment. For stringing one or two conductors to 556,300 CM.

MODEL 5000-WS-III Strings three conductors to 556,300 CM. For mounting on low-bed or full trailer.

MODEL 6000-WS-III Strings three conductors to 1,272,000 CM. For mounting on low-bed or full trailer.



Pengo Tension Wire stringer being used by the Bechtel Corporation stringing 1,033,500 CM ACSR Curlew, Calol-filled Cable for the Southern California Edison Co., Los Angeles, California.

The latest method of stringing conductors

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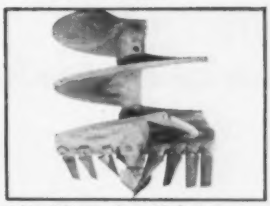
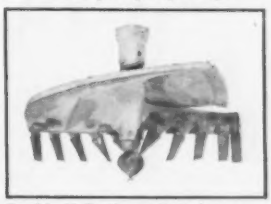
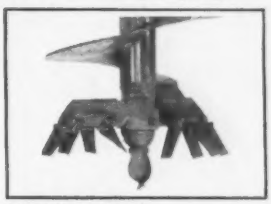


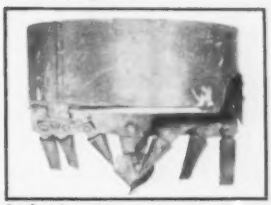
24 inch Heavy Duty Flight Auger



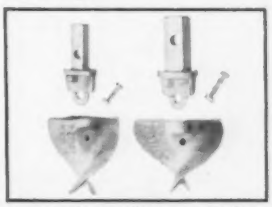
Double-Helix Heavy Duty Auger



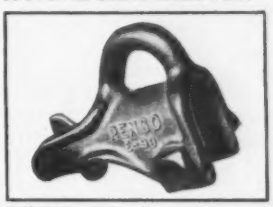
Offset Boring Head



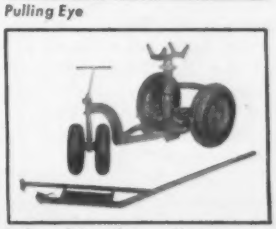
Bucket Auger



Screw Bit for Small Diameter Holes



Pulling Eye



Pole and Transformer Chariot

ELECTRA'S HUSBAND

"We Take Pride"

"THIS trip has convinced me that you people in the electric power business are not so smart in the public relations field as you try to make me believe." Electra had been silent for miles as we rolled down Highway 40 toward San Francisco. That statement indicated that she was either bored enough with driving to start a mild argument or that she had a small tidbit of helpful information which she had picked up on the trip we were just completing.

"Why do you say that?" I asked mildly, "It seems to me that people generally are pretty well satisfied with the service they are getting these days."

"I wasn't talking about service, that's pretty good," conceded Electra, "but about the way the electrical industry builds things and then leaves people to wonder what it's all about. For the past two weeks we've been driving through the intermountain country and I'll bet we've passed at least a dozen big hydroelectric stations and dams. I've been impressed with the lack of imagination that the owners of these dams and power houses display in keeping the general public in the dark about their purpose."

"I wish you'd be more explicit," I said. "I don't quite see what you're driving at."

"All right." Electra adopted the tone she uses with particularly stupid pets. "I'll try and explain. As a woman I'm naturally curious. As a citizen I'm either a taxpayer, stockholder or customer. Furthermore, I like scenic beauty and most of these dams are, for some reason or other, located at some of the most scenic spots in the West. Most of them are pretty impressive pieces of engineering too. I'd like to know more about them but if what we've been able to find out from the highway is any indication, they might as well be classified as top secret."

"Maybe the agencies that built the dam don't do as good a job of publicizing them as they might," I replied, "but it would cost a lot of money and be a lot of trouble to be as hospitable as you think they should be. Have you ever thought what it would mean to have the public tramping through a power house?"

"I admit that that might be impractical," conceded Electra, "but the least they could do would be to have a readable sign that would tell who built the dam, maybe how much it cost, and what it's used for. After all, we laymen don't know very much about a power system or even what electricity is. What easier way is there to help us visualize what electricity is than to tell us a little bit about one of the places where it's generated?"

"Oh come now," I protested. "There were several places that had just that kind of a sign. Only you didn't want to stop to take the time to read all of them."

"Now let me tell you about those signs," said Electra. "Most of them were in too small type and too crowded to be easily read and then they contained a lot of technical information that most people couldn't understand. As I look back on it, they seemed to fall into three categories."

"And just what are they?" I asked.

"Well, first there's the what's-it-to-you group. That's the group where the owner either isn't sufficiently proud of his work or interested enough in public opinion even to put a sign up telling the name of the project. We passed one of those in that rugged little canyon near Bonner's Ferry. I remember it because you asked the gas station man what dam it was and even he, a local resident, couldn't give you a satisfactory answer. There were several other places, too, where it seemed to me that the general public could have been invited to stop and take a look, at least.

"In my second category I think that the Albeni Falls site is the best example. This was the 'defensive' attitude. There was a sign stating that this project was being built by the Corps of Engineers and there was that little shelter which gave a good view of the project. The pickup literature, however, went into a lot of theory about downstream benefits and other intangible ideas instead of giving a straightforward account of what was going on. And that's the place where the literature invited an inspection of the power house but where the access road was posted with signs 'For authorized personnel only.' "

"That's two," I said. "What's the third?"

"That's the 'we-take-pride' category and that's the one I'm rooting for," said Electra. "There weren't very many of this type but I do remember the Cabinet Gorge plant and the Malad plant. At one of them the observation point was well fenced but it had a window in the netting for the people who wanted to take a picture of the power house and dam. I particularly remember the billboard giving the diagram and description of the Malad River system of plants. It was interesting and simple enough so that even I could understand it."

"In other words, you think that the pride of accomplishment is too latent in the electric power industry."

"You're darn right I do," she replied. "Out here in the West we pride ourselves on our tourist attractions and yet too many times are downright inhospitable in inviting visitors to see some of our most interesting sites. Every developer of a hydro project, whether it be a government agency, municipality or investor-owned utility, makes over the scenery, generally for the better. The dams are usually in spectacular canyons, the lakes created behind them are fine recreational areas and the whole project is useful as well as ornamental. It seems to me that the least that could be done is to provide parking space at a good lookout point, a sign or some literature telling the visitor a little bit about the project and a roadside sign or two far enough back so that those who are interested will have time to slow down and stop before whizzing by."

"How would you like to get up and express your views at the next convention?" I grinned. "I might be able to wangle you a place on the program."

"Not me," exclaimed Electra, "but I'd sure like to be in the audience if some adventurous program committee ever puts a plain John Q. Citizen up on the rostrum to tell you what he likes and dislikes. I'll bet you'd learn a thing or two."

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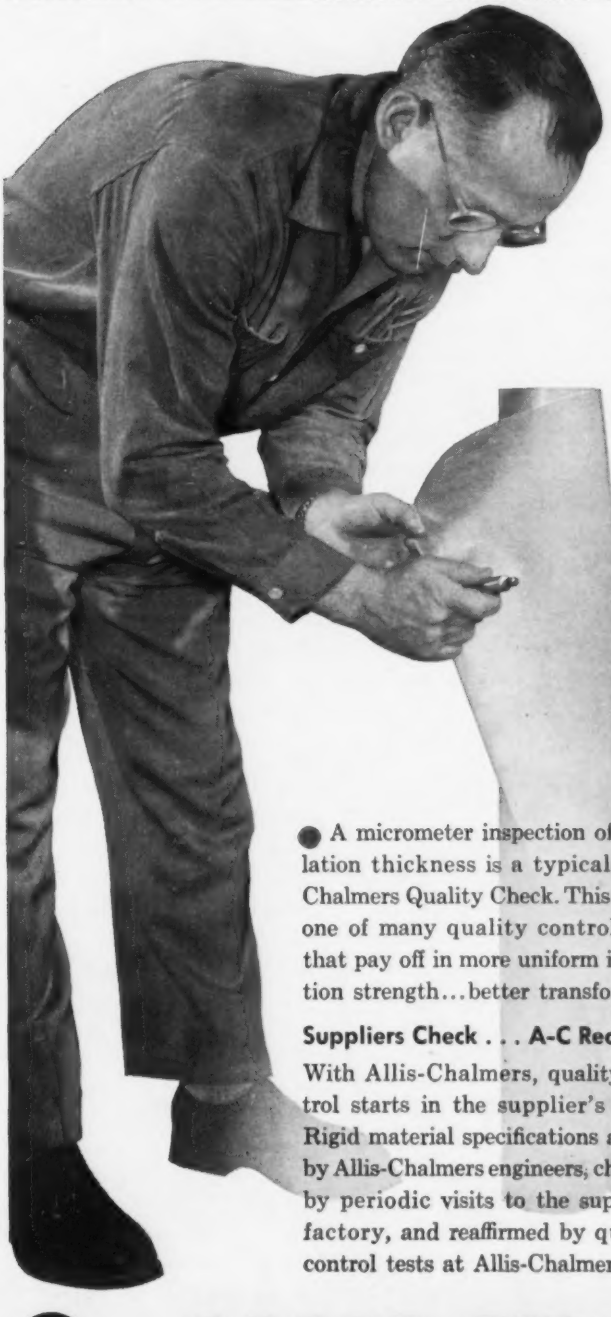
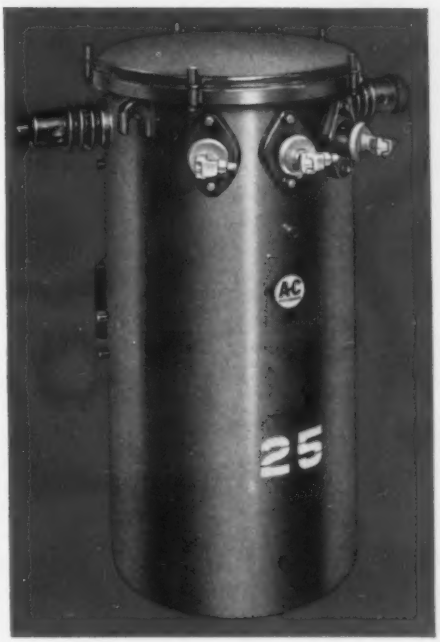


A "Check" that pays off with longer transformer life



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A MESSAGE TO AMERICAN INDUSTRY • THIRD OF A SPECIAL SERIES

THE SHORTAGE OF SCIENTISTS AND ENGINEERS:

A Threat to Economic Progress

THERE are two paramount reasons for concern over the serious shortage of scientists and engineers that now confronts the United States:

- The first reason, with which this editorial deals, is that continued expansion of our economy and further increases in our living standards are threatened unless we train more scientists and engineers and use them more effectively.
- The second reason for concern is that we run the risk of falling behind the Soviet Union in the technology so essential to national security. The consequences of losing this race to the Russians are not comforting. (The possibility that this might happen over the next few years was discussed in an earlier editorial in this series.)

The crucial contribution of scientists and engineers to the well-being of the American people has been to find ways of making better use of limited resources, to make equipment more productive, to develop new and better products that enrich our lives, to enable us to live longer and be healthier. They have made this contribution with greater success in the last 15 years than ever before, but it has required progressively more resources and more trained people.

During this 15-year period our annual production of goods and services, in dollars of constant purchasing power, has almost doubled. Since our total population has increased only 25 percent, this has meant a tremendous rise in the economic well-being of the American people as a whole. But in accomplishing this, the number of scientists and engineers has been more than doubled.

Tasks for Research

If the American economy is to continue to grow and if our living standards are to show further improvement, the work of scientists and engineers must be stepped up even more in the years ahead. Unless answers to several pressing problems are found through intensified research efforts, economic progress will become increasingly more difficult.

Productivity per hour of labor must be increased at a faster rate. Improved medical care has greatly increased the number of people who attain retirement age, and sharply higher birth rates since the war will mean larger numbers of children in school and college. Meantime, because of low birth rates during the depression, the number of people reaching working age is not rising nearly so fast. The result is that over the next 20 years our population will increase by about one-third, while the total manhours worked are not expected to increase more than 15 percent. So, simply to maintain the same living standards for a rising population — with no provision for additional improvements — ways must be found to enable each worker to produce for more dependents.

It is primarily to the scientists and engineers that we must look for help in making human labor more productive. This will require enormous increases in our power

resources. We will need to make more effective use of our existing fuel supplies — coal, oil and natural gas. And we will have to devise economically practical means of tapping other energy sources, particularly nuclear power and new rocket fuels.

Also, better ways must be found to use scarce and low-grade raw materials. Thanks to great strides in metallurgy and mining techniques, we are now utilizing sources of copper and iron ore that, for all practical purposes, were not available to us only ten years ago. Similar strides are needed in the mining and processing of bauxite if low-grade domestic ores are to help satisfy a fast-growing market for aluminum. And stubborn technical obstacles in the area of "high temperature" metals—such as nickel, cobalt, columbium, tantalum and titanium — are impeding progress in jet and turbine engines.

These are only a few of the challenging tasks that demand intensified research and engineering activity in the years immediately ahead if the United States is to continue to raise living standards. We need more houses, schools and highways for a rising population, more medical research to reduce further the ravages of illness, more research in chemistry and other sciences to sustain the flow of new and improved products that are so essential an ingredient of our economic progress.

Ceiling on Growth

American industry has indicated that it is ready to meet the challenge and undertake vastly expanded research programs. A recent survey conducted by the McGraw-Hill Department of Economics revealed that total research and development expenditures of American industry were almost $5 billion last year, 29% higher than in 1953. By 1959 business plans to be spending well over $6 billion on research and development. And the total could well prove to be much higher, based on the trend of recent years.

But industry's programs for research and development cannot be carried out unless enough qualified research workers and engineers are available. Ernest R. Breech, chairman of the Ford Motor Company, recently described the supply of engineers as the "ceiling on our future growth." He gave force to his point by announcing: "If 900 qualified engineers were to approach us next week looking for jobs, we would hire every one." The U. S. Bureau of Labor Statistics found in interviews with some 200 large companies at the end of 1954 — a recession year — that at least half were unable to hire enough research scientists and engineers to meet their needs. A third of the companies reported substantial shortages of technical personnel.

The shortage of technically trained people, furthermore, is becoming more acute. The number of engineers and scientists now being graduated is only about enough to cover replacement requirements, while the needs of industry, government and education are mounting every year. According to the best information available — as indicated in the first editorial in this series — these needs are now about twice as great as our current engineering graduating classes and annual production of scientists with Ph. D. degrees.

To perform the research needed to remove roadblocks to our economic progress — and at the same time hold our own in the technology essential to our security as a free nation — we must have an adequate supply of men and women with engineering and scientific training. Instead, we are faced with an acute shortage, now and for several years to come. Reasons for the shortage and proposals for working our way out of the shortage will be discussed in the remaining two editorials in this series.

This is one of a series of editorials prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments of particular concern to the business and professional community served by our industrial and technical publications.

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Donald C. McGraw

PRESIDENT

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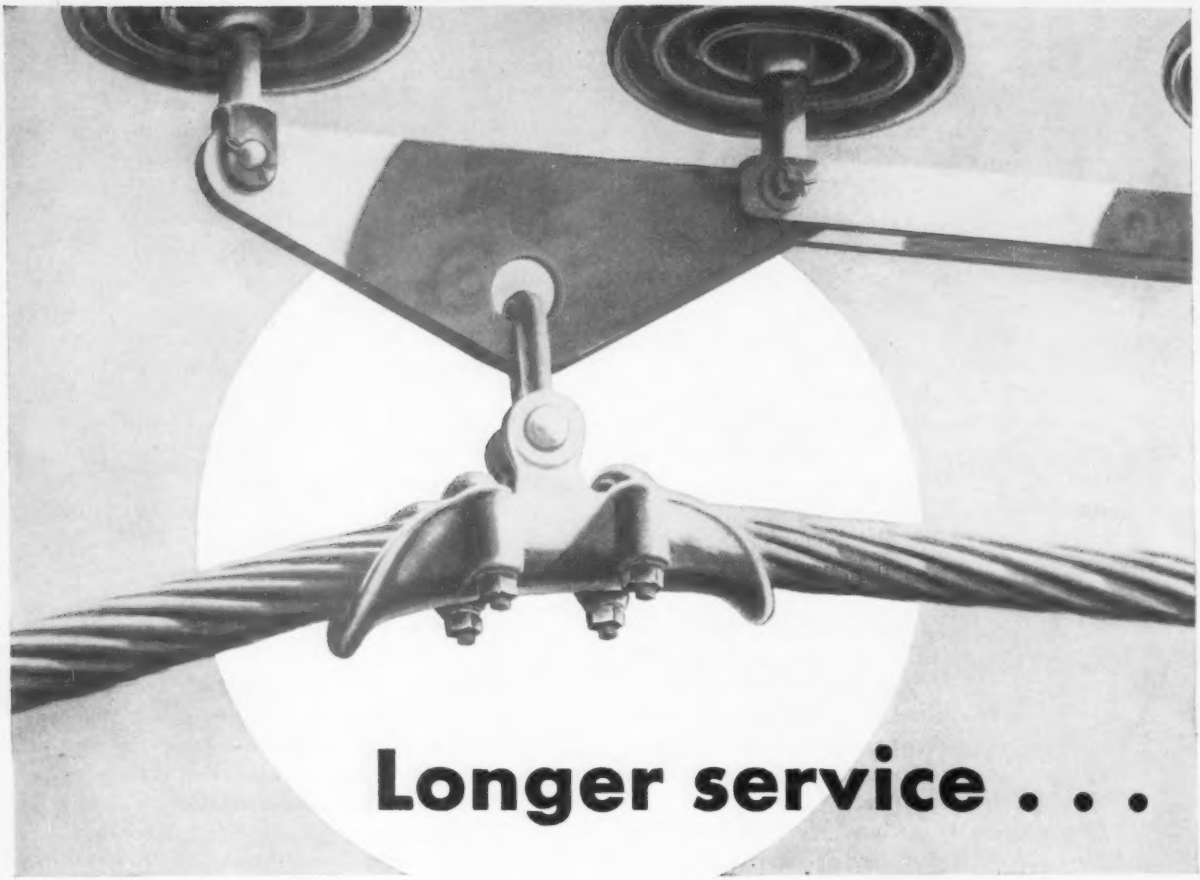

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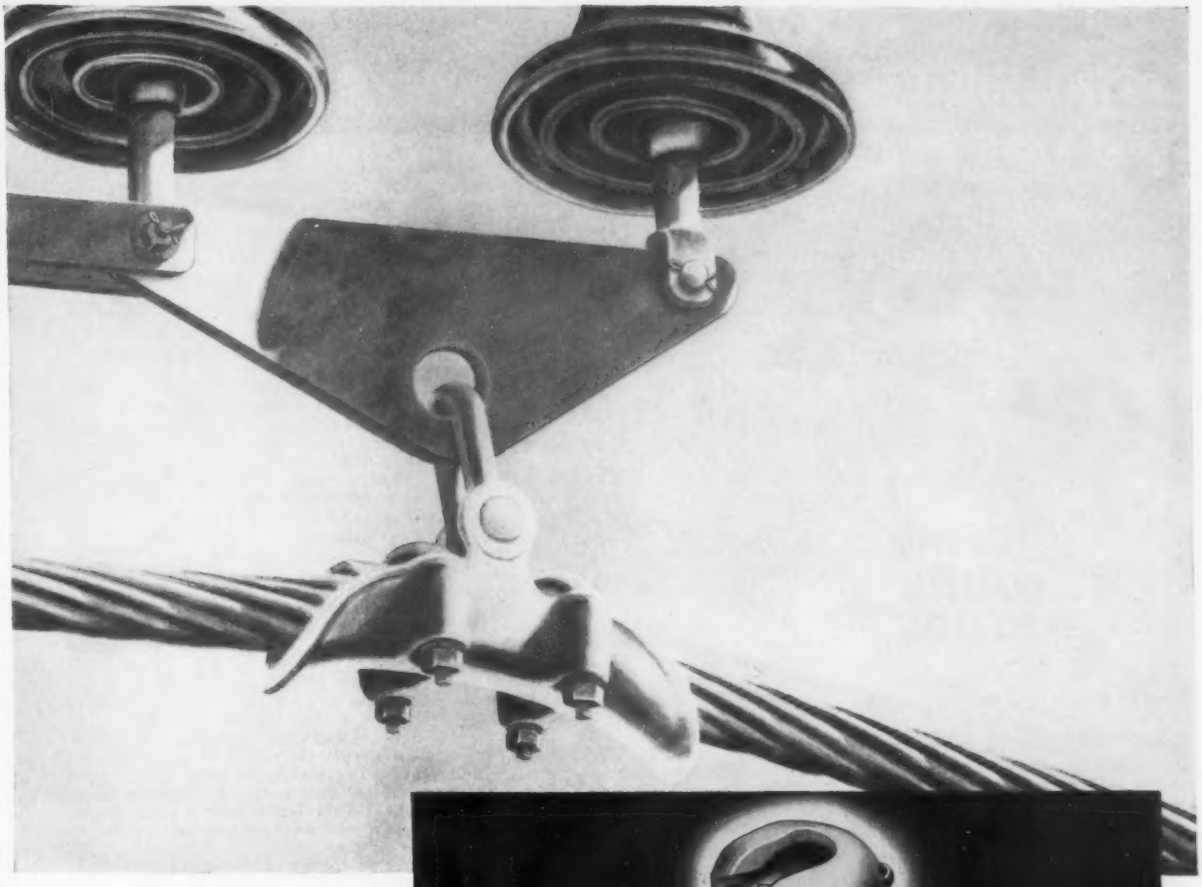

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LETTERS TO THE EDITOR

Takes Issue

To the Editor:

I do not know who the author is of the editorial entitled "Paradox in Subsidies" which appeared in the ELECTRICAL WEST, Vol. 116, No. 5, in May 1956, which you were kind enough to send to me but whoever he was, he certainly does not know the facts in the case. His editorial is full of errors, to say nothing of total misunderstanding of the project. I am afraid that he has been misled into copying some of the fantastic claims which were presented in opposition to this project.

For example, the new acres of farm land to be brought under irrigation under the Colorado River project is 132,360 acres, not 366,000 acres and, of this land, practically none of it will be brought into cultivation within 10 years and it will be more than 30 years before the last of it is brought into cultivation.

The cost of the Upper Colorado River Project is $760,000,000—not $1½ billion. That's quite a difference. The cost per acre in the most expensive project is $715 per acre and the average cost is only $491 per acre. That's quite different also from $1,500 and $2,700 per acre.

Forty-two per cent of the total cost of the irrigation facilities and the power facilities on the participating projects will be paid by those receiving direct benefits—namely, the irrigation water users, the municipal water users and the power users on the projects—42%, leaving only 58% to be paid out of main stem project power revenues. This is quite different than the 12% indicated in this editorial. Furthermore, the power revenues from the main stem power plants also come from the people in the area because they buy the power and therefore, in this Colorado River storage project, not only is there absolutely no burden upon the general taxpayer but 99% of the total cost of power and irrigation and municipal features is repaid.

It is regrettable that those who write and have access to the editorial pages of magazines such as ELECTRICAL WEST should be so careless as to use of figures and interpretations which have no validity and no basis in fact. The last paragraph in this editorial is so ridiculous that it does not justify comment.

As a matter of fact, and you can verify this by examining the records of the Bureau of Land Management and the Bureau of Reclamation, more money will be paid into the reclamation fund from the sale of natural resources in the four Upper Basin States during the period of construction of the irrigation facilities of the Colorado River storage project than the entire cost of the said irrigation facilities and will leave a balance of more than $155,000,000 in the reclamation fund. This simply means that not one dollar of the taxpayers' money goes into the Colorado River storage project . . .

GEORGE D. CLYDE
Commissioner of Interstate Streams
Utah Water and Power Board
Salt Lake City

Editor's note—In his letter pointing out apparent inconsistencies in our editorial, Mr. Clyde was quite right in stating that the present bill authorizing the Upper Colorado River Project does not include all of the acreage mentioned in the editorial. The figures which were used were obtained from what we have always found to be a reliable source of information and cover the ultimate basin development of the upper Colorado River. It is our understanding that this initial bill merely is the start of the entire project.

The latter statement is supported in a recent talk by Commissioner W. A. Dexheimer of the U. S. Bureau of Reclamation, before the American Society of Civil Engineers, in which he states: "Then an organization representing the four states, the Upper Colorado River Commission, was formed to deal with the federal government in developing a basin-wide plan for the use of the water." He goes on to say: "From this cooperative planning came a project, the initial phases of which were authorized by Congress this spring with the enthusiastic approval of President Eisenhower." After describing some of the details involved, he goes on to say: "This basin account will permit the development of a number of participating water-use units within the basin. Because of high cost construction, none of these irrigation units will be able to completely repay themselves financially. Nevertheless, the need for them and their benefits are so clearly demonstrated that they must be built if this last frontier is to be opened up as a prosperous contributing segment of our economy.

"Even though there was a basin-wide approach to the development of the Upper Colorado River Basin, as contrasted to the step-by-step approach in the Lower Basin, we are not waiting to learn the exact minute details of every phase of future need and work. We have a broad general concept of multiple-purpose development and a basin-wide approach to financing the necessary work. We are prepared to start work on the initial phases of that development and will fit other phases in as the need develops. Thus plans are remaining fluid in undertaking this multiple-purpose development which will require several decades to accomplish."

Competent engineering authority has stated that the ultimate basin development in the upper Colorado River will be a very expensive proposition. Even though the initial phase may, as Mr. Clyde says, be completely self-liquidating, past performance on both the estimates of initial costs and the ultimate repayment by water users has generally been disappointing from the taxpayer's viewpoint.

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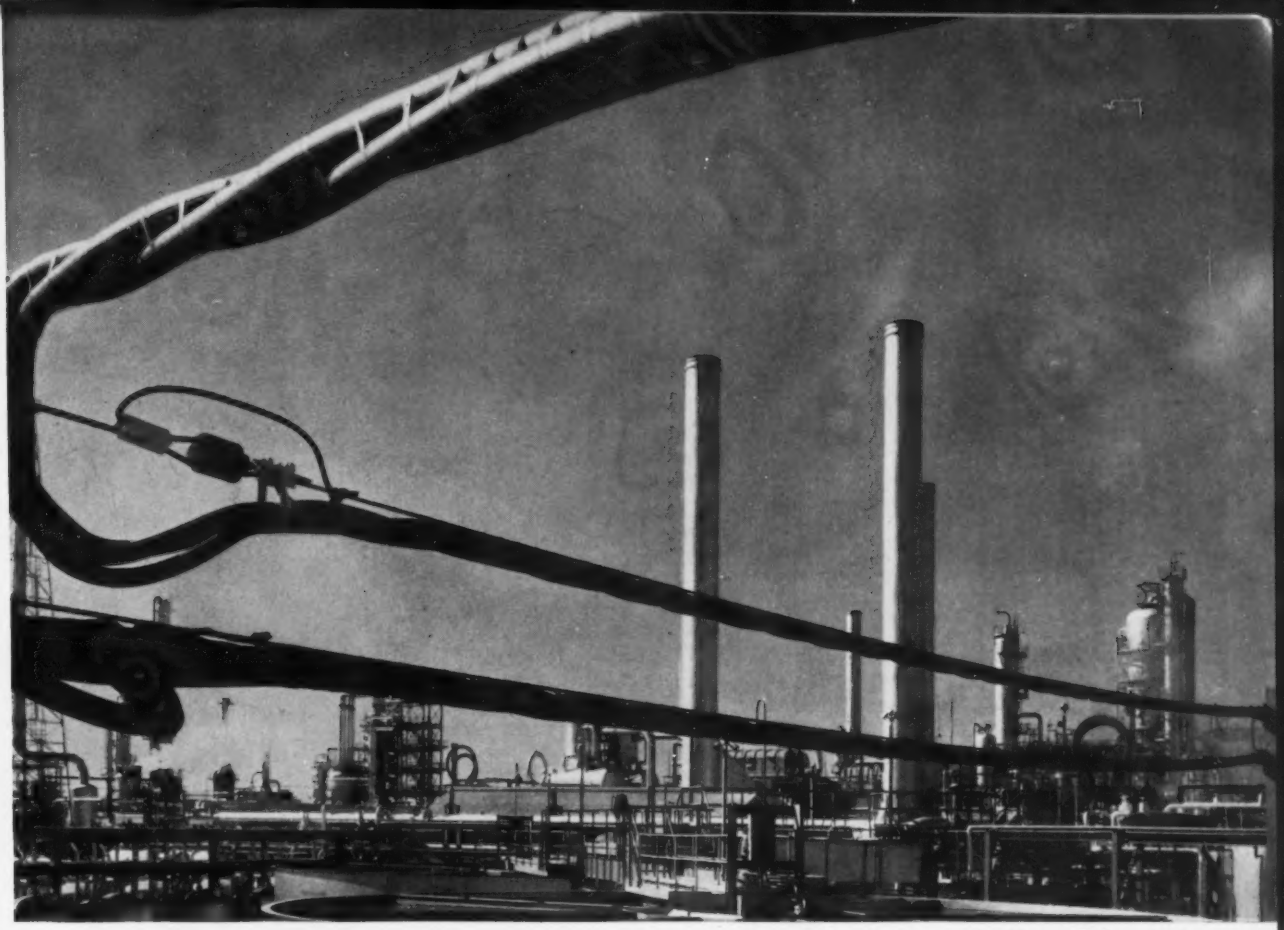

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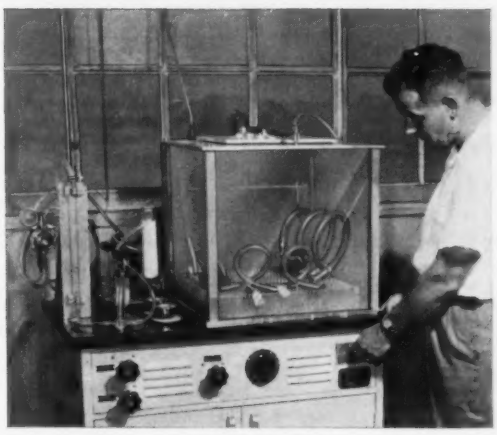

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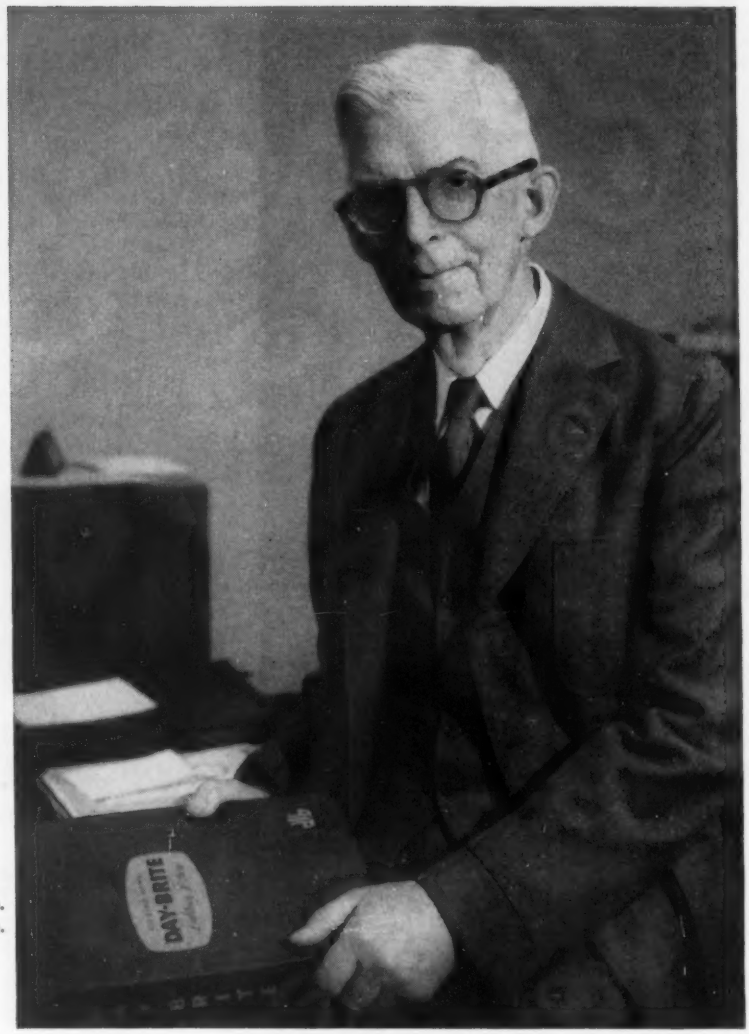

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NUCLEAR NEWS FROM ATOMICS INTERNATIONAL

Industry's First Private Research Reactor Now in Operation

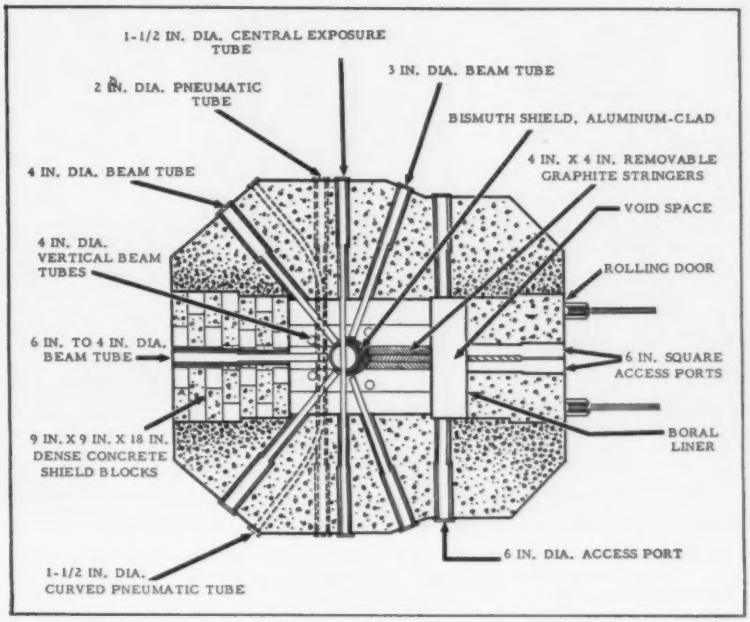
The Armour Research Foundation's nuclear reactor, located on the Illinois Institute of Technology Campus on State Street near Chicago's Loop, began operating early this spring. This marked the first time that private industry has had at its disposal a nuclear reactor expressly designed for industrial research.

Already under way at Armour are programs by participating companies, taking advantage of the revolutionary research techniques made possible by the new facility. The schedule includes allocation of reactor "time" for private studies, free of security restrictions. Areas of study include: food and drug processing; materials research – glass, ceramics, plastics, rubber, textiles, etc; petroleum, chemicals and other industrial materials and processes.

The Model L8 Armour reactor is of the homogeneous solution type, designed to operate at 50 KW and to produce a maximum thermal neutron flux of about 1.7×10^{12} neutrons/cm^2-sec at the center of the reactor core. Exposure facilities are provided through which the neutron flux is available in varying intensities for experimental purposes. Power level is controlled either manually or automatically by a vertical control-rod system. The reactor is safeguarded by a unique control system which "scrams," or automatically shuts down the reactor, if necessary.

One of several reactors produced by ATOMICS INTERNATIONAL, a Division of North American Aviation, Inc., the design and construction of the L8 Model is based on the company's 10 years' experience in the development of peaceful applications of nuclear energy. Other applications include a reactor designed for a prominent southern California university, specially adapted for cancer and other medical research; the important Sodium Reactor Experiment in the Santa Susana Mountains near Los Angeles, part of the AEC program to develop economical power from nuclear energy; plus development and design of a 75,000 KW sodium-graphite nuclear power plant.

ATOMICS INTERNATIONAL is a major reactor builder—experienced in the design, construction and operation of nuclear reactors for research and the production of power.


1-1/2 IN. DIA. CENTRAL EXPOSURE TUBE
3 IN. DIA. BEAM TUBE
2 IN. DIA. PNEUMATIC TUBE
BISMUTH SHIELD, ALUMINUM-CLAD
4 IN. X 4 IN. REMOVABLE GRAPHITE STRINGERS
4 IN. DIA. BEAM TUBE
VOID SPACE
4 IN. DIA. VERTICAL BEAM TUBES
ROLLING DOOR
6 IN. TO 4 IN. DIA. BEAM TUBE
6 IN. SQUARE ACCESS PORTS
9 IN. X 9 IN. X 18 IN. DENSE CONCRETE SHIELD BLOCKS
BORAL LINER
6 IN. DIA. ACCESS PORT
1-1/2 IN. DIA. CURVED PNEUMATIC TUBE

Reactor Plan View

ARMOUR RESEARCH REACTOR MODEL L8

Characteristics

Design Power	50 kw
Zero Power Critical Mass*	850 gm U^{235}
Maximum Thermal Neutron Flux	1.7×10^{12} n/cm^2-sec
Mass Coefficient of Reactivity*	0.03%/gm
Temperature Coefficient of Reactivity*	−0.029%/°C
Fuel Solution Temperature at 50 kw*	80° C
Excess Reactivity at 20° C, Zero Power*	3%
Reactivity Held in Control and Safety Rods*	8% (2% each rod)
H : U^{235} Atomic Ratio*	350
U^{235} Concentration*	75gm/liter
Power Density, Maximum	5.5 watt/cm^3
Power Density, Average	3.85 watt/cm^3

Approximate Value

Brief General Description—The reactor fuel is a light water solution of UO_2SO_4, enriched in U^{235}. This fuel is contained in a spherical stainless steel core tank, which is surrounded by a graphite reflector. The reactor is shielded with high density concrete (density 3.5 gm/cm^3) plus other selected materials. Fuel-handling, gas-handling and cooling systems are provided; also complete instrumentation and equipment are installed for remote operation and to provide automatic safety action.

Experimental Facilities—The experimental facilities include nine assorted beam tubes, 3" to 6" ID; straight and curved pneumatic tubes, 1½" and 2" ID; central exposure tube; horizontal thermal column 5' square, with four 6" access ports. In addition there are special exposure facilities which make use of the gamma activities in the reactor atmosphere.

If you are interested in any phase of our activities, ATOMICS INTERNATIONAL is staffed and equipped to help you. Please write: Applications Engineering Service, Dept. ET-N3, ATOMICS INTERNATIONAL, P. O. Box 309, Canoga Park, California. Cable address: ATOMICS.

ATOMICS INTERNATIONAL
A DIVISION OF NORTH AMERICAN AVIATION, INC.
PIONEERS IN THE CREATIVE USE OF THE ATOM

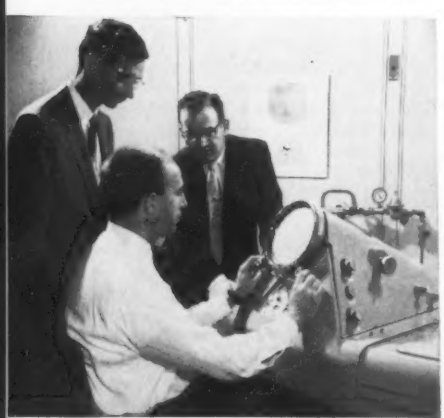
VALUABLE DATA is being supplied at G.E.'s Turbine-Generator Development Laboratory through full-scale testing of turbine and generator components. Above in the Laboratory, E. H. Miller, J. E. Downs, and C. E. Kilbourne, all of G.E.'s Large Steam Turbine-Generator Department, discuss plans to implement additional low-pressure steam path design concepts—a significant area of improvement in large size steam turbine-generators.

System economics pose the question—

How high will steam conditions go?

Knowledge gained from 4500 psig—1150 F developmental unit, and orders for machines up to 450,000 kw indicate the limit is still a long way off

The electric utility industry, confronted with spiralling fuel and labor costs, will watch with interest, the performance results of the first super-critical pressure turbine now being installed at American Gas & Electric System's Philo Station. Steam conditions are 4500 psig, 1150 F/1050 F/1000 F as compared with conventional conditions of 2400 psig, 1050 F of large units now going into service. Technical know-how gained from this developmental unit is already being applied, and considerable industry attention is now being focussed on several turbine-generators recently ordered having initial steam conditions of 3500 psig, 1050 F, with double reheat at 1050 F.



CONTINUING METALLURGICAL STUDIES are developing steels to handle tomorrow's steam conditions. Here, D. L. Newhouse, W. C. Hagel, and A. W. Rankin study materials used in supercritical pressure components of American Gas & Electric's No. 6 unit at the Philo Station.

These major technological advances promise to help the utility industry capitalize on margins for improvement still available in the steam cycle. Each, too, will provide significant answers to the question: "How high will steam conditions go?"

It has long been recognized that lower fuel consumption per kwhr through the use of higher steam pressures, higher temperatures and the reheat cycle is an important means of offsetting rising fuel costs. According to a recent G-E study, significant fuel savings appear possible from further increases in pressure and temperature up to 10,000 psig, 1450 F.

At General Electric, engineering developments in metallurgy and turbine-generator designs are under way to make possible new steam cycle advances and to help utilities meet the need for increased system efficiency. Progress must also be made in further development of those components affected by steam conditions to help make such machines engineering practicalities.

While percentage heat rate gains are smaller, the over-all dollar value of the fuel savings in large size units would be even greater than in the past, assuming a continuation of historic trends in fuel costs.

A copy of the recent study on advanced steam conditions, "Margins for Improvement of the Steam Cycle," may be obtained by writing General Electric Company, GER-1070, Schenectady 5, N. Y.

301-299

MORE POWER TO AMERICA

GENERAL ELECTRIC

ELECTRICAL WEST

VOL. 117, NO. 1
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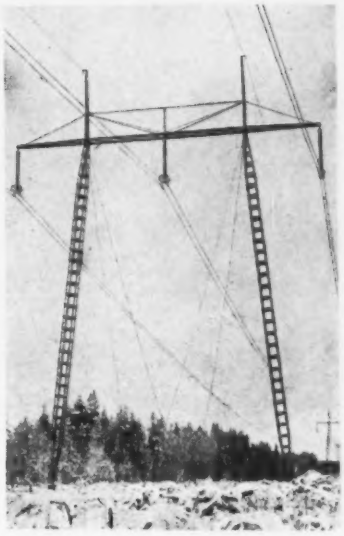
SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U. S.

A summary of foreign EHV

Transmission Practice

Russia, Finland, Germany and France are building 380-kv bundled conductor lines. Sweden considers 650 kv



Normal light steel tower supported by four guys being used on the Finnish 380-kv line

Power transmission problems in many foreign nations, particularly in Europe, are similar to those of the Far West. The West led in high-voltage transmission for many years, but now this country must look to foreign nations for experience in extra-high-voltage transmission and especially the use of bundled conductors.

Every two years there is held in Paris the Conference Internationale des Grands Reseaux Electriques a Haute Tension. As a member of this conference group, the editor of ELECTRICAL WEST received copies of some 300 papers to be presented at this year's meeting in Paris, held May 30 to June 9. Some of these papers on EHV transmission were selected for review here as being of greatest interest to the West.

General Comments

Extra-high-voltage transmission is being increasingly used for bulk transmission of electric energy as well as for transmitting electric power long distances.

Bundled conductors are being used on all 380-kv lines; two per phase being used in France, England and Sweden, and three being used in Russia. In Sweden a third conductor is being added, in some cases, to the present two-conductor arrangement. In Germany four-conductor lines are being built. Bundle conductors are being used in several countries on transmission lines as low as 110 kv, largely to increase line capability.

Series capacitors and shunt reactors are also used to increase line capability and provide voltage regulation respectively, particularly in the 380-kv range.

There is a belief prevalent among some engineers in some of the countries that the line and system design must be arranged to provide for sleet melting. Keeping ice off the conductors is a major concern to them; other engineers apparently do not consider this an absolute necessity.

Voltages above 380 kv are being seriously considered and will most likely be used if economically justified. One country reports that its 380-kv system will operate at a maximum voltage of 420 kv.

The radio interference influence problem is still being studied theoretically, by field research, and on practical lines now in service.

D-c transmission of large blocks of power is still being studied by some countries. These comments were taken from paper No. 418.

Swedish Practice

The demand for power transmission over the Swedish trunk line system is now expected to reach very much higher figures than was the case 10 years ago when the 400-kv system, now in course of construction, was first planned. In these circumstances a further investigation of the system voltage to be adopted in the future is called for. Three main alternatives are being studied: the retention of 400 kv, a change to 500 kv over the greater part of the system and the superposition of a 650-kv net on the 400-kv distribution network in the north and south. The 500 kv has been selected as the highest possible voltage for the present 400-kv line design, and 650 kv is regarded as the highest conceivable operating voltage.

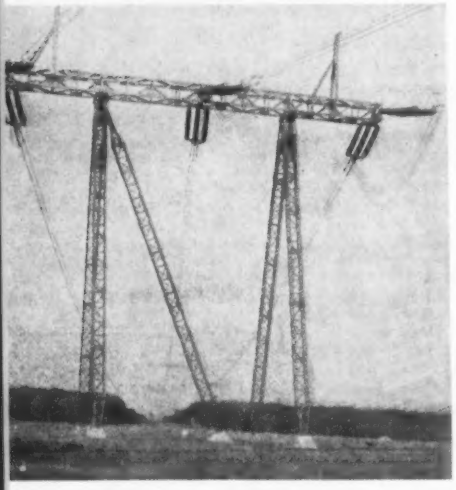
For the lengths of line of about 550 km, which are usual in the Swedish system, the insulation level for the new 400-kv installations can be limited to 1,300 kv. At 500 kv a level of 1,600 kv is necessary and at 650 kv about 2,000 kv. By employing heavy multiple conductors it is believed that corona and radio interference can be kept within permissible limits. It would appear that the short-circuit power is not likely to exceed 18,000 mva, which should not give rise to insuperable difficulties for apparatus designers.

To permit an economic comparison new line designs for 500 and 650 kv have been prepared. It appears possible to manufacture the necessary auto-connected 500/400-kv and 650/400-kv transformers in single-phase units up to 400 and 300 mva respectively.

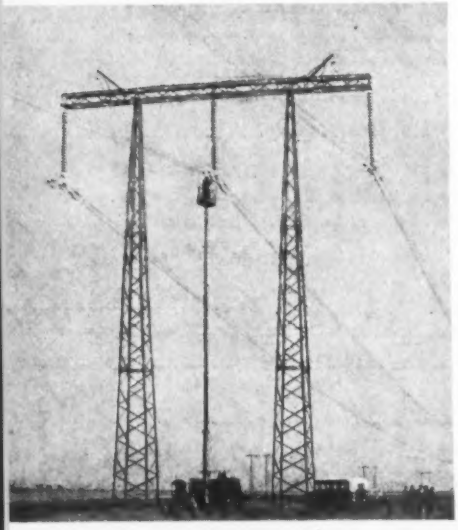
With regard to the switchgear the chief difficulty would be encountered in producing 650-kv circuit breakers which are reliable in operation and therefore the employment of such apparatus is not contemplated.

The optimum loads on the lines have been assessed at about 800 mw at 400 kv, 1,000 mw at 500 kv and 1,700 mw at 650 kv. A preliminary comparison of costs for a schematic network shows a slight reduction in the costs when changing from 400 to 500 kv and a somewhat greater reduction when adopting 650 kv. The detailed investigations relating to the future Swedish power system had not been completed when the present report was prepared but preliminary results tend to show

Russian bundled conductor releasing clamp opens, releasing conductors when all fail



Russian strain-angle tower design that made possible uniform series for different angles



Moscow line towers offer metal saving, ease of installation, also lower transport costs

that the costs at 500 kv and 650 kv will be about the same.

The existing network is operated at a maximum service voltage of 400 kv. The power lines are provided with two ACSR conductors per phase, each having a cross section of 593 mm² and a diameter of 31.7 mm, which results in radio interference that can be tolerated. The transformers, cables, circuit breakers and other apparatus are designed for this working voltage.

The alternative 500 kv has been chosen after rough calculations and has shown that the 400-kv lines and switchgear can be employed for this voltage after slight alterations. The insulation is adequate since the internal voltages rises are reduced owing to the continual increase in the short-circuit power connected up. The question of radio interference can be solved by the installation of a third conductor in the bundle or by changing the conductors, which can be done by taking certain reinforcing measures at the towers. No new technical problems of importance are encountered in connection with the choice of 500 kv and, generally speaking, it is possible to proceed on the basis of the experience gained with the 400-kv network.

The operating voltage 650 kv represents value that can be selected at the present day with regard to the insulation problem. Here the reconstruction of the lines and redesigning of apparatus will be necessary, and it is necessary to reckon on a new system superposed on the existing one.

No complete designs are available at present for 500- and 650-kv lines or stations, since the question of introducing either of these voltages is still under investigation.

It is proposed to construct the lines with gantry towers similar to those already in use in the 400-kv network. Minor modifications would be made with a view to reducing costs. The normal span would be about 350 m at 500 kv and 400 m at 650 kv. The towers would be stayed. The conductor equipment would normally consist of three 593 mm² ACSR cables arranged in an equilateral triangle with 45-cm sides at 500 kv and four 593 mm² ACSR cables arranged in a rectangle with 40- or 45-cm sides at 650 kv. The insulation level would be 1,600 at 500 kv and about 2,200 at 650 kv. It is assumed that insulator strings with cap-and-pin insulators would be used and the electric stresses on the lowermost units would be reduced by means of a grading ring. Due consideration would be given to the Swedish standards for the insulation of overhead lines, which are now in preparation, when determining the phase spacing, etc. The latter would probably be 12 m at 500 kv and 15 m at 650 kv. The lines would be provided with two skywires and a continuous ground wire in the districts where the earth resistance of the towers themselves exceeds 30 ohms.

The above was taken from paper No. 411.

Russian 400-Kv System

In 1952 construction work on the Kuibishev-Moscow 400-kv transmission was started. The 400-kv south circuit and the east receiving substation in the region of Moscow have already been completed and are now in operation at 400 kv. The line is designed to deliver power from the Kuibishev hydroelectric plant to Moscow.

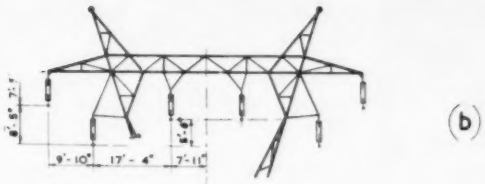
The power table transmitted by the line is 1,150 mw; 6.1 billion kwh are to be delivered in a year of mean water flow. Three switching stations will be built along the route. The middle station will have a series capacitor installation.

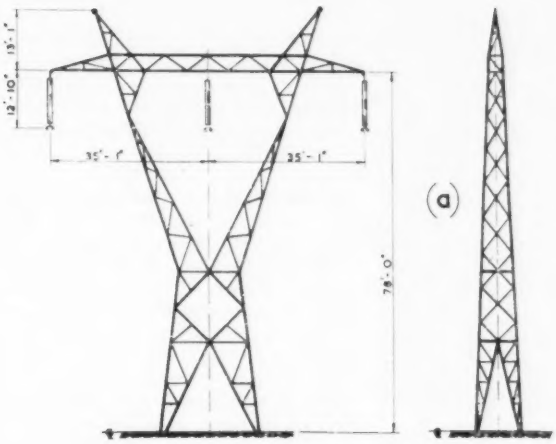
The south circuit will be 815 km while the north circuit is 890 km in length. The line is designed for three different loading conditions. For the section of most severe loading wind velocity adopted for design purposes is 35 m/s, corresponding to a wind load of 236 kg per meter of single-conductor line. The ice deposit on the conductor is 15 mm in thickness, corresponding to an ice load of 1.92 kg/m of conductor length.

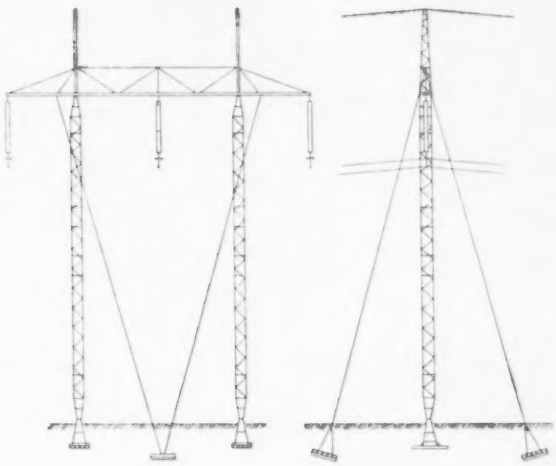
An ACSR conductor is used having an aluminum cross section of 480 mm² and a steel cross section of 59.7 mm². There are 54 aluminum strands and 19 steel strands in the conductor. Each phase of the line contains three conductors located at the apexes of an equilateral triangle having a 400-mm base. The total cross-sectional area of aluminum in all three conductors of one phase of a circuit is 1,440 mm². Cross section was determined on the basis of an economic current density of 0.6 amp/mm². The number of conductors in the bundle arrangement and their spacing were determined by necessity of reducing the inductance of each line circuit to be 0.29 ohms/km. The ground wire will be of steel, having a cross section of 70 mm² and an ultimate strength of 130 kg/mm².

The insulator string assembly on suspension towers supports the three bundle conductors in a releasing clamp. This clamp opens releasing the conductors from the string only when all three conductors fail. Tests of the releasing arrangement during severe sleet conditions showed that it operated well for conductor failures.

A beam system is used to obtain equal distribution of stresses along the three parallel conductors assembly.







Dual-voltage tower design to be used in Australia. Line will first be operated as a 132-kv double-circuit line as shown in (b) and later converted to a 330-kv single-circuit line as shown in (a). Below is shown the type of guyed tower proposed by the Swedish for 400-, 500- or 650-kv lines. Conductor equipment would consist of three ACSR cables arranged in an equilateral triangle for 500 kv and four cables arranged in a rectangle for operation at 650 kv

This beam system takes on stress from a common three-rod unit connecting all three conductors of the split phase. The distance between parallel conductors in a phase is fixed by spacers.

The towers are of metal-weld construction. The line is mounted on single-circuit towers. H-type suspension towers are used, having hinged connections between legs and crossarms. This type of construction has distinct advantages from the standpoint of metal expenditure, convenience in erection and maintenance, and transport costs during construction.

Wagons on caterpillars containing three cable reels capable of uncoiling simultaneously were used to string the conductors (on the ground—editor). The three conductors of one phase were strung simultaneously by three 80-hp caterpillar tractors.

Air breakers have a current rating of 2,000 amp and 1,000 amp, and an interrupting capacity of 10,000 mva. Their clearing time is three cycles.

Complete details of the Russian 400-kv system are given in paper No. 413.

German 380-Kv System

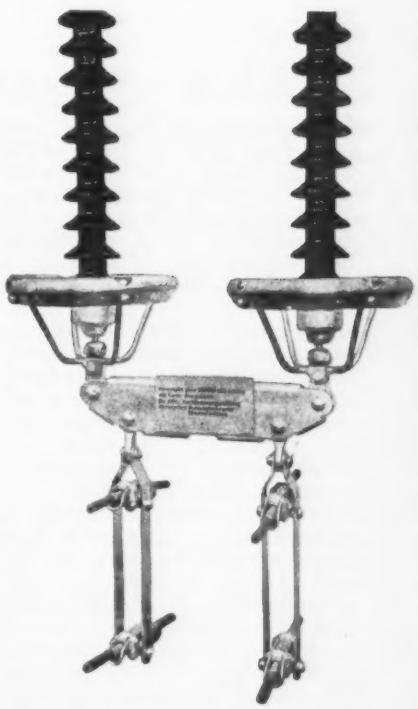
In order to satisfy the increasing demand for power in western Germany in the near future, it was decided in 1949 to commence the necessary preliminary work for the construction of a 380-kv interconnected system. Construction is under way and operation is intended to start at 380 kv in 1957. As a result of studies, it was decided to supplant the 220-kv system by another operating at a nominal voltage of 380 kv, with a voltage variation of 360 to 420 kv.

Operation of extensive 220-kv systems with arc-suppression coils (Petersen coil) in Germany and Sweden has shown that the earth-fault arc could no longer be interrupted rapidly and with certainty, even if suppression coils were properly tuned, when due to extension of the system the residual earth-fault current exceeded a value of approximately 200 amp. This and other considerations led to a decision to use solidly earthed start points.

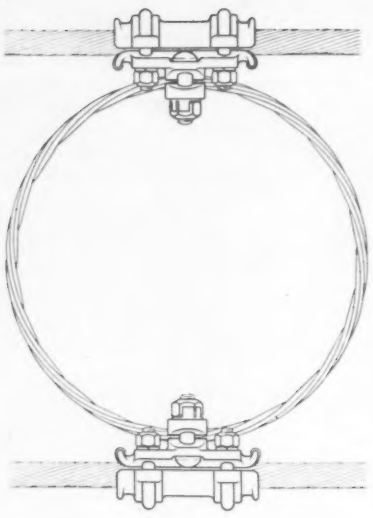
Insulation Level

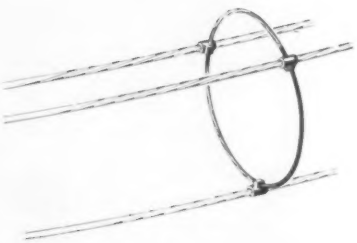
Impulse withstand insulation levels for the various parts of the system vary from 1,280 to 1,800 kv. Studies showed that faults on the 220-kv system would not exceed 8,000 mva, nor those on the 380-kv network 12,000 to 14,000 mva, even if large generating capacities are connected or the system is operating in conjunction with foreign networks.

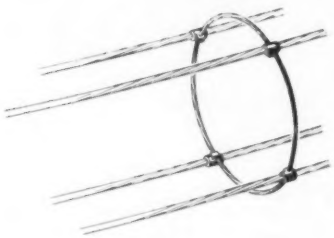
On no-load at 380-kv operating voltage every 100 km of length of line will produce 65 mva capacitive power per circuit. During light load periods this demand cannot be absorbed by the connected lower voltage networks, since these themselves will have a surfeit of capacitive power. To balance the



Grading shields with insulated grading rings at insulator string for German 380-kv system under construction. Also shown is the interesting suspension assembly for the four ACSR bundled conductors used on the 380-kv lines. Operation at 380 kv starts in 1957







Line of circular, flexible spacers for bundled conductors manufactured by A. Salvi & Co. of Milano, Italy. Spacers made for twin-, triple- and quadruple-conductor installations are shown. Spacer design was based upon criteria established as a result of European field experience. Ohio Brass is licensed to manufacture and sell spacer in the U. S.

charging current of the 380-kv lines, reactors are proposed. These will be connected to the 30-kv tertiary windings of the 380-kv transformers. They will be constructed in 50-mva, three-phase units in order to avoid heavy jumps when they are put into or taken out of circuit. Full compensation of the charging current of the 380-kv lines is intended. It is intended that the lagging reactive power should be produced in the distribution network as near as possible to the places where it is consumed, so as to avoid its transmission over great distances. Energy is therefore to be taken from the 380-kv system as far as possible at unity power factor.

As was expected, experience and economic studies showed that lines with four bundled conductors had the lowest corona loss and the least radio interference. Of the possible ACSR cables suitable for construction of these bundles, namely 240/40 mm² and 210/55 mm², the former is generally preferred. Double-circuit towers are being used. The 380-kv lines are to be equipped with a continuous earth wire along the whole of their length. After a thorough investigation of all aspects of earthing, the same type of ACSR conductor was chosen for the earth wire as for the bundle conductors.

Information on transformers, substations, intercommunication and other features is given in paper No. 409.

Finnish 380-Kv System

Construction of the first 380-kv line in Finland started in 1954. The northern 380-km-long section will be placed in service in 1956 at 220 kv. When the southern section is completed two years hence, the voltage will be changed to 380 kv along the whole 650-km line. It is planned that the 380-kv system will consist of two 380-kv lines.

At present there are two 220-kv lines which, with the first 380-kv line, will have a transmitting capability of 800 to 900 mw. With the second 380-kv line, 1,600 mw can be transmitted, which it will be possible to increase to 2,000 mw by using series capacitors. Autotransformers will be used to connect the 220-kv lines with the 380-kv lines.

Portal-Type Towers

A distinctive feature of the 380-kv lines is that they will use portal-type guyed steel towers, as shown. This allows a relatively light construction, the average weight of the tower being only 14.5 t/km. From the economic point of view, the equivalent span length has been fixed at 350 m.

The 380-kv line will be equipped with two conductors per phase. Cross section is 2x635.5 mm². Spacing between conductors in one phase is 45 cm and the average phase distance is 11 m.

Suspension clamps are of a new type which, by a wedge lock, prevents the conductor from sliding at conductor breakage or uneven ice load. Under normal conditions the compression force on the conductor at the clamp is relatively small. In addition, the conductors are equipped with tapered armor rods. The spacers are of the type used on the Swedish system. The distance between spacers does not exceed 90 m. When using twin conductors and spacers, the risk of vibration is found to be so small that dampers are not considered necessary.

Additional information is given in paper No. 406.

EVH in France

The French reported on research undertaken to perfect the technique in the construction of transmission lines. Particular attention was given to the design of a tower of a more economic type, on large section cables without torsional reaction that give a very low electrical field in the steel core and, last, on suspension accessories that avoid unnecessary stresses in conductors.

The paper goes into tower and suspension clamp design in some detail. Tension stringing of large ACSR conductors and other construction problems are discussed.

Application of refined design technique is described as applied to a new 225-kv, 275-km line placed in service early this year. Three 592-mm², ACSR conductors were used. Satisfactory safety, improvement in the material utilized and a reduction in quantities have been achieved in the refined design. These various dispositions can bring, from the technical point of view as well as from the economical point of view, a very appreciable progress in the achievement of very-high-voltage transmission lines. These points were taken from paper No. 225.

It was reported that late in 1957 France will have converted 309 miles of two-circuit, 225-kv line to 380 kv. Use will be made of two shunt reactors of 45 mva each. Bundle conductor of 1.04 in. outside diameter and 16 in. spacing will be used. Present convertible line (225 to 380 kv) is 740 miles, in which the 309 miles are included. Committed to be built is conversion of 260 miles of 225-kv line to 380 kv. There are 475 miles of line to be built originally for 380 kv. By 1960 it is expected there will be in service at 380 kv 1,475 miles of circuit. These will operate at 420 kv maximum. This summary was made from paper No. 418.

Developments in Australia

Power developments have led to the conception of a large 330-kv transmission serving the needs of the states of New South Wales and Victoria. In South Australia, a special transmission problem will be solved by the use of 275 kv.

For the 330-kv line a type of two-circuit tower was designed that will

initially carry two 132-kv lines. When converted to 380 kv, the six conductors will be arranged in two bundles. Conductors will be 54/0.117 in. aluminum and 7/0.117 steel, diameter 1.053 in., bundle spacing 15 in., phase spacing 37 ft.

Circuit breakers proposed are 10,000 mva with three- to four-cycle switching time. Conditions seem favorable to single-pole, automatic reclosing. It will mainly depend on the procurement of satisfactory relaying equipment whether this mode of operation will be successful.

Complete exposition of Australia's transmission problems is given in paper No. 401.

Review of Canadian Trends

The proposed development in Canada of hydroelectric sites more distant from the load centers is bringing to the fore the use of bundled conductors. From studies so far made, the opinion is that for lines requiring the transmission of 100 mw or greater, over a distance in excess of 250 miles at 60 cycles and voltages of 230 kv or more, the use of bundled conductors should be considered. Another application arises on older transmission lines that were originally constructed on heavy loading assumptions, where it may be both economical and practical to rebuild the conductor assembly with twin conductors of heavier total cross section. However, up to the present time very little practical experience has been developed in Canada with bundled conductors.

Cost Factors

There is a greater trend toward the use of double-circuit transmission lines in Canada today. Higher cost of land for rights-of-way, the cost of clearing heavily wooded properties and the maintenance of these rights-of-way are becoming an increasing factor in the over-all cost of transmission.

Paper No. 221 gives the complete Canadian philosophy.

Explanation

The line cuts and halftones used in this review of foreign practice are not up to ELECTRICAL WEST standards as it was necessary to make reproductions from the reproductions in the papers. Nevertheless it was felt that, even though poor, they would have reader interest. The illustrations of the circular spacers for twin or multiple conductors are a product of A. Salvi & Co. of Milano, Italy, and were included to show spacer design of one European manufacturer.

Inspecting Bonneville's new EDP machine are Eugene C. Starr, chief engineer, Administrator William A. Pearl and Earl D. Ostrander, director of administrative management

Digital Computer for BPA

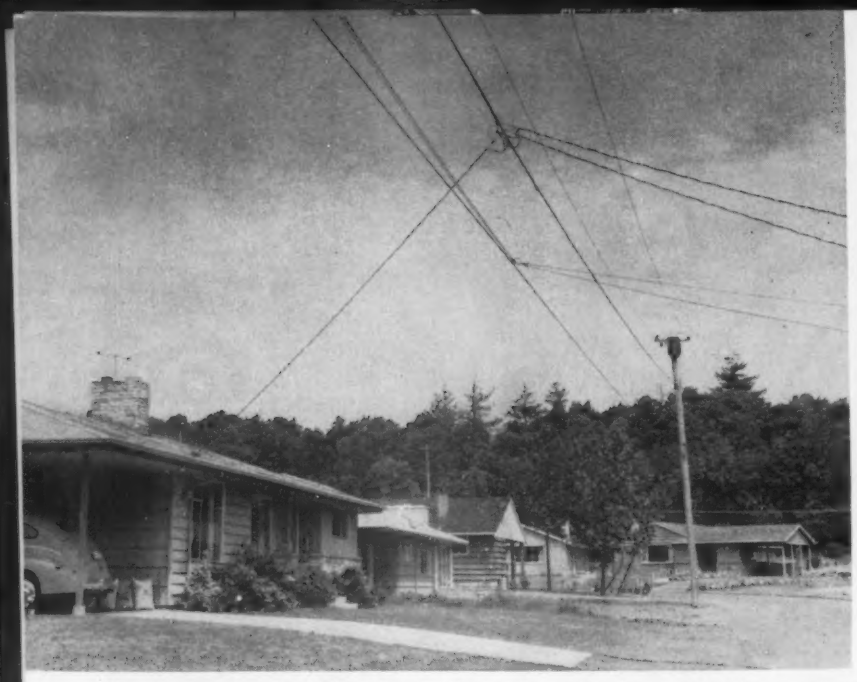
First application of the high-speed electronic data processing machine to utility engineering problems has been made by the Bonneville Power Administration. Precise calculations for use in decreasing power transmission losses alone are expected to effect savings approximating the monthly rental cost of the IBM digital computer.

Many Uses

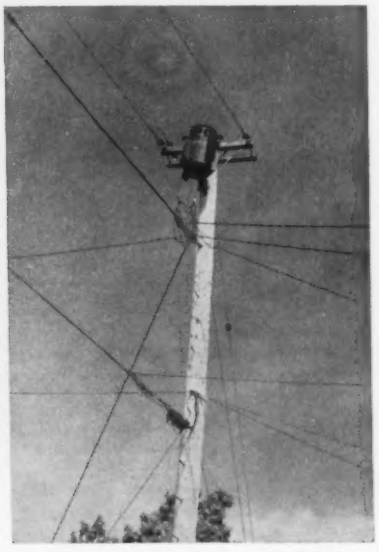
Among important uses for the computer are the following. Load flow studies—a most promising use is for load-flow studies. An a-c network analyzer is now used but there is definite need for more precise solutions than can be obtained from an analog-type computer such as the a-c analyzer. Optimum accuracy of the analyzer is 1 to 2% of total power. With the IBM machine it is expected to be able to reduce losses 1% from their present 6%. New facilities planning—system additions can be studied more completely, accurately and quickly with the 650 computer. Interconnection studies—an assessment can be made of the actual value of proposed interties rather than the apparent value assumed by taking the interchange power directly. Wheeling charges can be assigned more exactly and equitably than by present methods. This is important because of the development of wheeling arrangements for partnership projects.

Operating studies—operation studies to achieve optimal or near optimal economy in the system can easily be made on the type 650 computer. Load forecasting—the computer will be available to convert monthly kwh deliveries obtained from individual meter readings into average kw deliveries over the same period and compare these with the load estimates for the same period for each customer. This operation cannot be performed with present equipment because of limited storage capacity. Another use for the machine will be for relating loads to resources. It is expected also to use the IBM 650 extensively in hydrology studies, particularly for the most economical use of storage.

More or less standard routine uses include inventory accounting, consolidated agency pay roll, account distribution and plant records.



New tract construction with midspan triplex service taps on long span triplex secondary



Five triplex services from transformer pole

Studies show that

Present Voltages Are Adequate

Present practices, trends are reviewed. Existing 120/240-v secondary, 4-kv primary to serve future residential loads

H. V. Strandberg*

Chief Engineer
Seattle City Light

In considering system planning to meet future load increases, our first concern is the residential customer. For the purpose of this discussion, we may reasonably assume that residential load will double in the next 10 years and quadruple in the next 20.

We have studied many schemes of molding residential load to reduce system peak and improve load factor. These include time-clock and carrier water-heater load controllers, and demand-limiting devices designed to prevent simultaneous full utilization of range and water heater. These devices look good to the utility when the investment in such control is compared to the cost of providing peaking capacity, but the actual savings that may be passed on to the customer are not commensurate with the loss in convenience and availability he experiences. The technical and economic advantages of the application of such devices are rapidly being submerged in the general increase in residential load. Some utilities have installed such systems, but we will see no increase in their application and will see some now in service discontinued.

We are greatly concerned about the impact of electric heating and air conditioning on system capability. The heat storm of 1954 caused an unprecedented demand for room air conditioners, the installation of which taxed both overhead and underground system capacity. Coming at a time of high ambient temperature, the capacity of utility plant was at the same time reduced. This prompts the reappraisal of equipment loading practice to meet the new conditions.

Utilities serving such areas are seeking a load to supplement the summer air conditioning load and are looking with favor on the heat pump which, under these conditions, may well become competitive with fossil fuels.

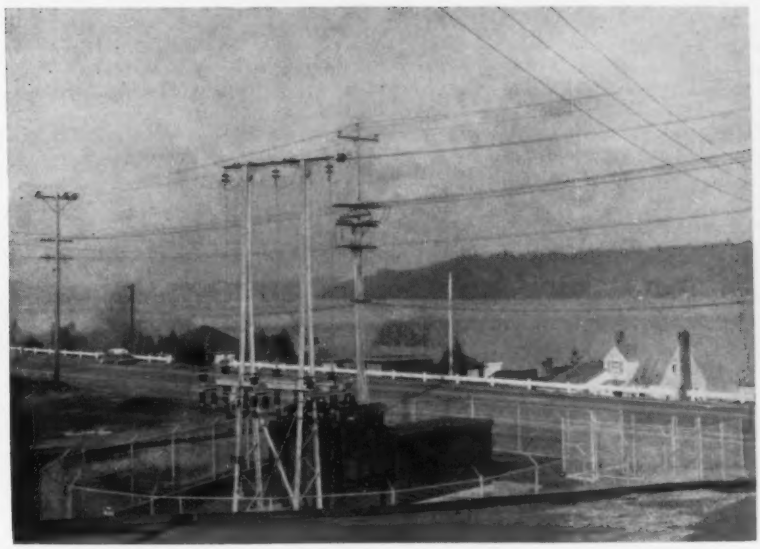
Resistance heating is gaining favor rapidly in new apartment houses. In this application, the heat loss is small because of one-wall exposure and small volume. The apartment house owner can make each tenant responsible for his heating bill. Moreover, the tenant is happier because he can regulate the heat to suit his own desires.

*Taken from a paper presented before the convention of the American Public Power Assn., Los Angeles, April 24-26.

Secondary Voltages

Numerous studies have been made to determine the economies of higher utilization voltages in residential service. These studies seem to be in general agreement that three-phase, 277/480-v systems have an economic advantage if used in the initial development of medium and high-density load areas. This system may find application in large housing projects, some containing as many as 14,000 units. Such an installation would provide much needed information on the adequacy, economy, adaptability, safety and public acceptance of these higher voltages.

These systems require the use of an autotransformer on the customer's premises to provide 120/240-v circuits for lighting and small appliances. Much



Typical 6,000-kva sub with 26-kv overhead supply, 4.3-kv cable feeder to overhead primary

of the modern home lighting is provided by portable lamps of high wattage. Every year we see new items added to the family of portable appliances: mixers, blenders, roasters, grills, deep fryers, irons, etc. The sizing of the autotransformer would be extremely difficult. It must be assumed that local electrical codes would require as conservative rating in the autotransformer as in the service entrance of which it must be considered a part. The economic studies of higher utilization voltages must include the installed cost of this autotransformer and its capitalized losses. This may well reduce the possible benefits of higher voltage to insignificance.

Studies indicate that the present 120/240-v, three-wire, single-phase service voltage is adequate to serve all reasonably predictable ranges of load density and that the economics of the system is such that conversion to higher voltage cannot be justified. This system, supplied from 4,160-v feeders, is serving diversified customer loads of more than 3 kva, consuming 10,000 kwh per year with area densities of 6,000 kva per square mile. It appears entirely feasible to economically serve double this load density.

Primary Voltages

The single-phase, 2,300-v feeder systems are being converted to higher voltage, 4,160-v primaries will continue to be used in urban areas, particularly where distribution substations are supplied at 23 kv or higher. Where 12-kv subtransmission has been used in urban, suburban and rural areas, the distribution feeders will be converted to that voltage. In such areas, future expansion of feeder capacity will be at that voltage.

As is expected, there is a definite trend toward the use of larger distribution transformers, the 25 supplanting the 15, the 37.5 the 25, and so on. The manufacturers have made a valuable contribution by reducing the weight of distribution transformers.

A 100-kva transformer will soon be available that weighs no more than the old 75. The reduction in size and weight of transformers in the range of 25 to 100 kva has afforded a solution of the pole space limitations of the foreseeable future.

The practice of banking secondaries to improve voltage regulation under motor starting will increase in favor.

Distribution substations 13.2 kv and below will tend toward the factory-built unit substation with bus regulation. Whether package or built-up substations are used, standardized designs will be used to reduce engineering time and installed cost.

Bus voltage regulation will gain favor over single-phase or feeder voltage regulation in service to residential areas. We have purchased no feeder voltage regulators during the past 13 years, during which our 4,160-v distribution substation capacity has increased from 182,000 kva to 762,000 kva. The primary network system of distribution, no doubt, contributes to the success of bus regulation but the fact remains that we are now giving our customers better regulation than we ever did with feeder voltage regulation.

The trend in subtransmission is to higher voltages. The course of this transition has and will continue to be determined by existing system voltage levels. As has been pointed out, 12.4-kv subtransmission voltage will become the feeder voltage and the former 55- to 69-kv transmission voltages will become subtransmission voltages. Systems using 23- to 34.5-kv subtransmission voltages may well continue such operations in the foreseeable future.

The capacity of transmission systems will be increased by superimposing higher voltages, which in large systems will reach 345 kv. In the Northwest we are beginning to look upon the existing 230-kv system as a subtransmission system, which in the future will be supplied by 345-kv bulk power transmission. For this reason few long 230-kv lines will be constructed in the future.

A conventional type of construction in Seattle is armed secondary with triplex services

Static Capacitors

The static capacitor has been developed into a relatively low-cost source of reactive to supply the exciting kva of motors, transformers and heavily loaded circuits. The application of this device, switched and unswitched at the load, on the primaries and at major substations, will grow with the increase in motor loads in air conditioners and heat pumps. There is a need for an improved method of switched capacitor control, simple and low enough in cost to control capacitors switched at the primary level. Some experimenting is being done with control direction coming from the secondary of distribution transformers in order to secure a control responsive to load. Time-clock control cannot be considered an adequate solution because of the operating expense of timer checking.

The application of pole-mounted capacitors is creating some safety problems of concern to all of us. Our safety supervisors, engineers and manufacturers are cooperating to find a satisfactory solution. The problem is the result of there being no external evidence that a capacitor is discharged.

Aluminum Conductors

Aluminum will gradually supplant copper as a conductor for most purposes. This drift to the use of aluminum will be forced by economic considerations. Copper production will not keep pace with the demand for electrical conductor created by the quadrupling of our load in the next 20 years.

Transition to the general use of aluminum in distribution systems is deterred by the difficulties of making adequate and permanent joints and splices. The more conservative distribution engineers have hesitated to accept the risk of increased maintenance costs of aluminum-to-copper joints. The economic pressure is, however, too great to resist. Improvements in jointing materials, techniques and adequate tooling, together with training of personnel for the job, will eliminate this problem.

Acceptance Good

The use of triplex aluminum service conductor is rapidly increasing. Public acceptance of the triplex service has been good because of its better appearance. While the material costs somewhat more than weatherproof, because two conductors must be insulated, reduction in installation time in many cases is more than offsetting.

Many installations of triplex aluminum secondaries are being made with various types of cabling. Midspan service taps, the installation of which becomes a simple matter with the mechanical man lifts now finding acceptance in utility work, holds forth economies by reducing the number of poles required solely for terminating service drops. This construction has the advantage of improved appearance.

Increasing cost and reduction in the supply of poles, together with better chemicals and treating techniques, will result in more general application of full-length treating of cedar poles. Pole life of 40 to 50 years may be achieved. Full-length treated poles of other species have been used in many areas for years. Some concern has been expressed about the dwindling pole supply. These fears are not well founded, for a new pole can be grown in the life span of a full-length treated pole. The trend toward treating forest products as a crop will take care of future pole supplies if the future needs of utilities are made known.

To meet the requirements of our growing systems, we are demanding of the manufacturers units of plant having more capacity in smaller volume, better performance, greater reliability and lower operating and maintenance costs. The manufacturers have risen to the demand. In order to take full advantage of current and future improvements in apparatus, it is necessary to make new determinations of outage probabilities and the effect on service of second- and third-order contingencies. Such surveys will often point to simplification of system and substation layouts with more effective use of plant investment. ASA emergency loading standards will be applied as a basis for loadings over name-plate rating under first- and second-order contingencies.

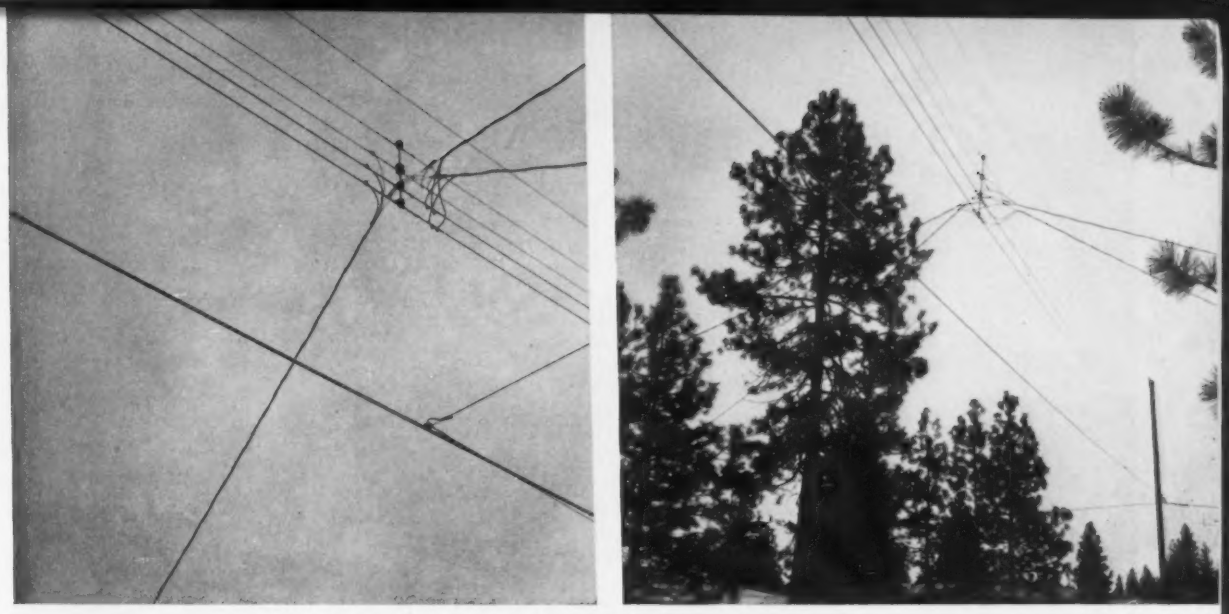
Must Forecast Needs

We may expect that the next 10 years will see a continuation of development of electrical apparatus and utilization equipment demanded by the utilities to meet their public responsibility. The utility must forecast its future requirements in order that development by the manufacturer will be in advance of need. Standardization, primarily for the purpose of improving quality and reducing costs, must reflect the needs of the industry. The small utility as well as the large should be heard in this matter.

Let us move forward into the next decade with the conviction that we can adequately and economically meet the challenge of the atomic age.

Electric Bunsen Burner Ends Need for Gas

Out of a entry in a high school science contest by the son of a utility engineer comes a practical electric "Bunsen" burner that could eliminate the expense and the only remaining need for gas in schools and many commercial laboratories. The electric Bunsen burner is here illustrated with its inventor, Donald Sinclair, son of R. E. Sinclair, rate engineer for Pacific Power & Light Co., Portland. Air impelled by a small fan passes through a 500-w element and exhausts through a hole in the cupola of the burner. Housing of the burner remains only warm to the touch. Present air temperature is ample for heating glass rods for bending and for heating test tubes and beakers, although much higher temperature could easily be provided. The device could be used in the same manner and for the same purposes as the conventional Bunsen burner employing gas as fuel.



Economy and nice appearance are achieved with this long-span, racked bare wire secondary with midspan taps. Primary is on ridge pin

Looks good—costs less

Long-Span, Racked Bare ACSR

L. G. Fanning
Plant Superintendent
Washington Water Power Co.
Spokane

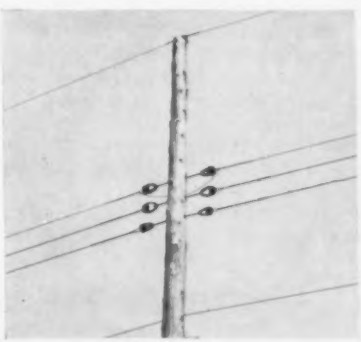
A year's experience by the Washington Water Power Co. with long-span, racked, bare ACSR secondary and midspan triplex services has shown no inherent objections to this type of construction. Original objectives of pleasing appearance and economy have been realized.

The accompanying photographs are views taken in a new residential tract. Conductors are No. 2 neutral, 1/0 hot legs and a No. 4 for street lighting. All are six strands of aluminum over one of steel. Wires were sagged for 60% of ultimate strength at –20 F. The temperature the past winter was somewhat below this and the only trouble experienced was splitting the dead-end insulators. This, it is believed, was due to making the loops too small around the insulator and choking it. Standards have been changed from a dry-process insulator to a wet-process porcelain to give additional strength.

Another comment that may be of interest was the use of preformed dead-end grips. Some doubted that they would hold this tension satisfactorily for any considerable length of time. Experience seems to indicate that the grips held, as the sag this spring in these spans does not appear to be any more than in spans dead-ended by more conventional means using connectors.

A suggestion to anyone contemplating this type of construction would be to keep the neutral wire above the hot legs. This would make it more convenient in changing out or replacing damaged conductors in the future.

Lines are in alleys with average span lengths of 300 to 320 ft, with some as long as 360 ft. Secondary racks are mounted on extension brackets, as shown, to comply with Washington state regulations. Common primary and secondary neutral is used. Excepting on transformer poles, the single 12-kv primary wire is mounted on ridge pins.

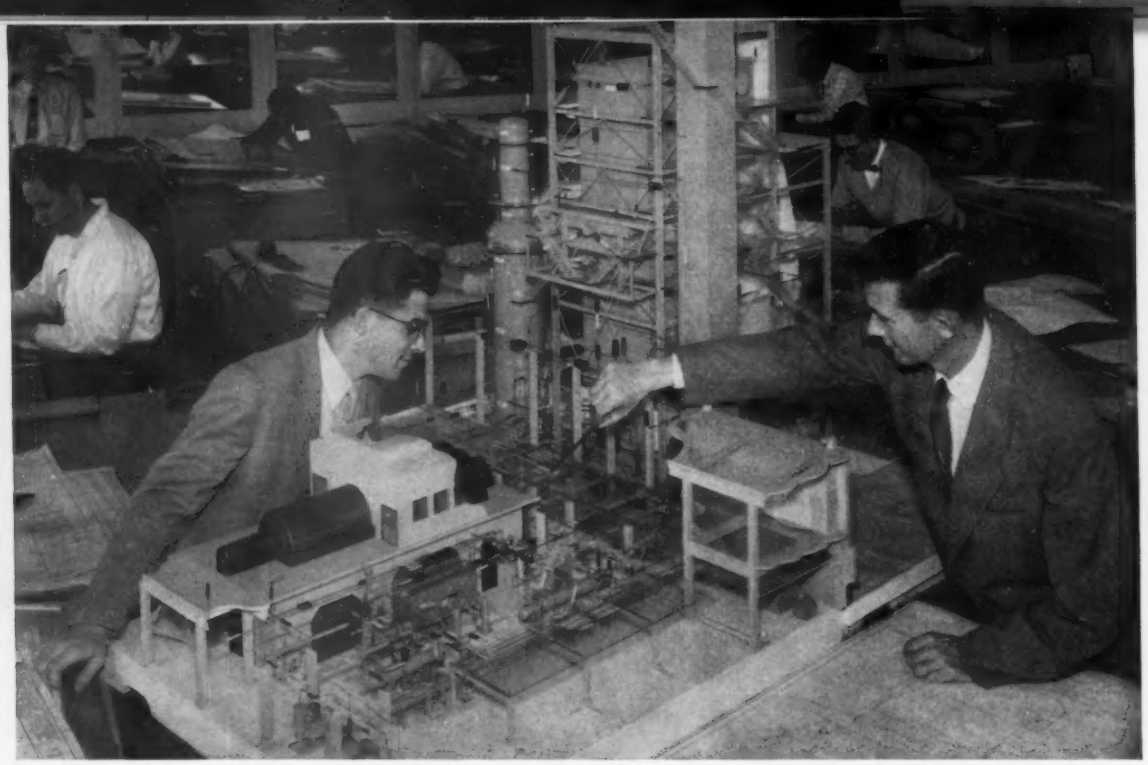


Preformed dead-ends proved satisfactory

The only problem with this type of secondary construction is keeping the midspan spacers from rolling the secondaries when triplex service taps are made. Line crews themselves have largely worked out this problem by the use of plastic take-off supports and balancing the tension of the insulated triplex service wires. Moreover, there is now on the market a new spacer that holds promise of solving this problem simply and economically.

The telephone company is quite willing to go joint on this type of construction as it benefits also from the economy of the long spans. Some engineers have feared that the secondary would present a zigzag appearance from single services pulling off in opposite directions. There is no need for worry on this score because actually the small deflection is not noticeable except to one who is looking for it by sighting directly along the line.

In addition to realizing the economy of eliminating about half the number of poles formerly required and cutting the conductor cost approximately in half, the Washington Water Power Co. feels that it has contributed to the satisfaction of tract developers and homeowners with a more sightly type of construction.



Use of scale models of power plants such as this has been found to reduce project costs in addition to having many other advantages

Use of models lowers costs in

New Plant Design Approach

J. A. Falcon, Project Enginer, Power Plant Engineering Department, The Fluor Corp. Ltd., Los Angeles

Utilization of scale models is a new design technique developed by Fluor during the past several years, which results in reducing over-all project costs as well as improving plant layout and design. This has been applied successfully in designing plants for the petroleum and chemical industries. Drawing upon this wealth of experience, these techniques have been extended to the utility industry for what is believed to be the most extensive use of this new tool for generating station design, layout, construction and operation.

The application of models to a new project should be of interest to those concerned with the various phases of new power plant planning. The following illustrates the use of this procedure during the recent design phase of the San Bernardino plant, unit No. 1, 66 mw, 1,800 psig/1,000 F/1,000 F reheat, of the California Electric Power Co.

Upon completion of the conventional heat balances and flow diagrams, these drawing were turned over to a layout designer. It is at this stage, ordinarily the first phase of design work for the engineers, that the new technique becomes evident. Assigned to the layout designer is one or more model makers, the combination forming a coordinated team. These teams are housed in a one-story, 8,000-sq-ft building devoted exclusively to model construction. The designer is situated directly adjacent to the model makers. In this same building are the drills, lathes, foundry, paint shop and other tools to permit fabrication of scale models of the structural and equipment components for all types of plants. It is felt that success in the utilization of scale models is directly attributable to the formation of the above-mentioned teams and also to the company's policy of integrating the model makers so that they are as much a part of engineering services as are the draftsmen.

Working from the flow diagrams and heat balances the layout designer, in close conjunction with the principal engineers, developed several plant arrangements in sketch form. The model makers translated the two-dimensional sketches to three-dimensional scale models. Conferences with the client and principal engineers during this phase of the project permitted approval of a definitive layout in minimum time because of the visual aspect of the model.

With the major equipment arrangement approved, the model makers and the model were transferred to the general drafting room of the project. Here, as before, working with key piping, structural and electrical designers, and from rough sketches only, the model makers expanded the model to include the auxiliary equipment, all piping runs, valves, conduits and miscellaneous details. It is interesting to note that up to this point, other than the flow diagrams and site drawings, no drawings other than rough sketches, freehand in some cases, were completed. The drafting personnel assigned to the project during this period were an absolute minimum.

When the model was fairly well complete, the project was staffed with drafting personnel to turn out finished drawings. It was found that finished construction drawings were completed in approximately half the time it would

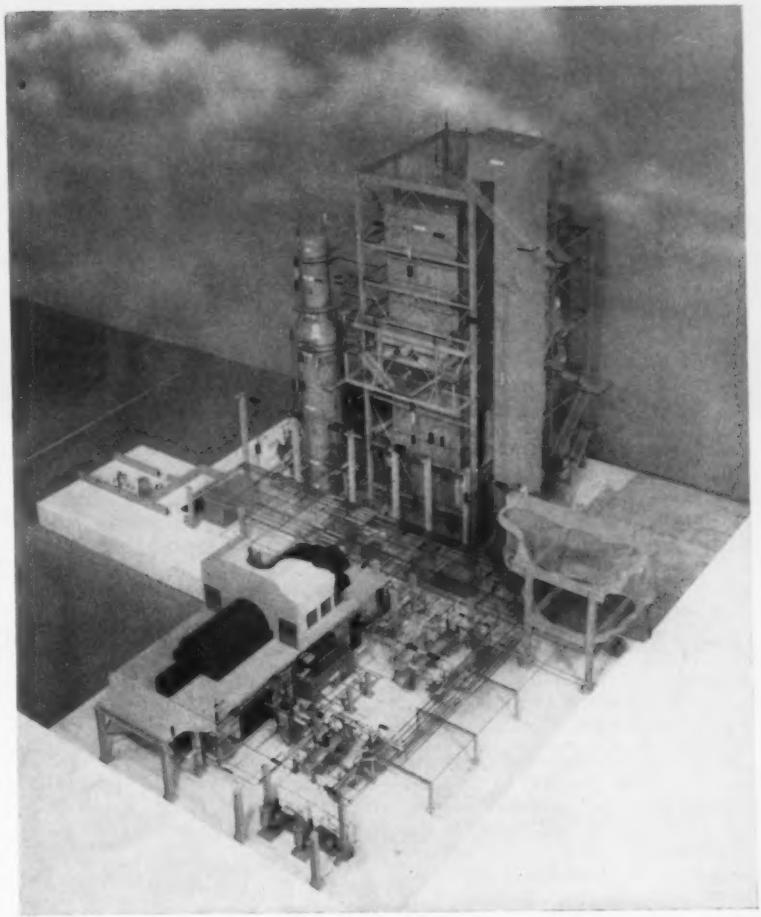
have taken if no model existed. All during this phase of the design, the work was conducted in conjunction with the principal project engineers and the client's engineers.

These models, illustrated, are now the finished product of this integrated engineering-drafting model maker design approach. Shortly, they will be sent to the field superintendent to assist the construction forces. While at the site, California Electric Power Co. will use the models to train operators.

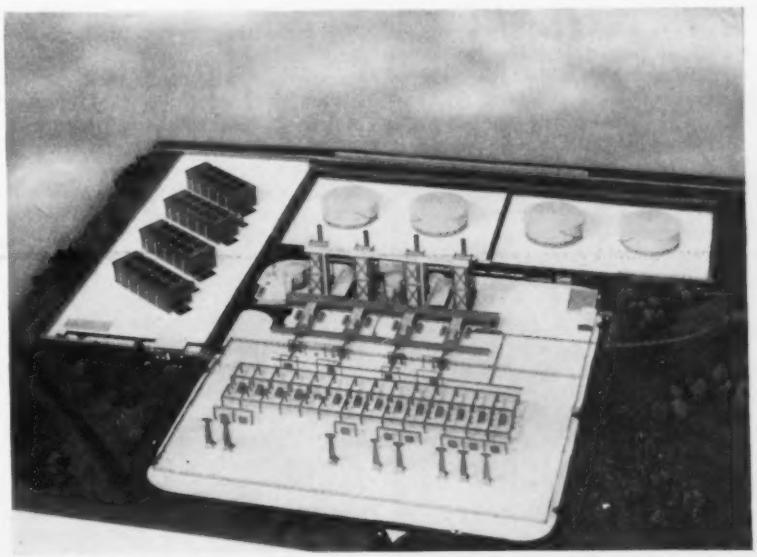
In addition to the main models, several larger scale models were made to study particularly vexing problems. One such model of clear plastic was made of the piping under the turbine within the turbine pedestal. The main steam, reheat, extraction, oil and drain lines were shown on the model and served as the basic piping design for this area both for the designer and turbine manufacturer. This one item resulted in considerable savings since this particular piping was resolved expeditiously rather than through the tedious interchange of drawings between the two companies.

From a cost standpoint, when one considers engineering services (drafting and model making), it has been found that sufficient drafting time is saved to more than offset model costs. Since the use of models does not result in any increase in project costs, the tangible and intangible values resulting therefrom and obtainable on a "free" basis may be listed as follows: (1) layout of equipment is accomplished more expeditiously; a better plant results because of this ease in preparing layouts; (2) lines, pipe and conduits are more economically routed, interferences are readily noted and avoided; (3) design errors are apparent and corrected before drafting hours have been expended; (4) time for completion of drawings is lessened for the draftsman can see that which he is putting down on paper; less revisions result; (5) the client's engineers and executives can readily follow progress of the design; they can suggest changes on the spot; (6) the field force can better schedule the work with this visual picture in front of them; (7) labor craft divisions can be established in advance, thus avoiding misunderstandings; (8) operators can more readily be trained in advance.

To everyone who has worked with this new approach to central station design, a strong current of enthusiasm exists for even expanded future possibilities. Fluor has found models to be of inestimable assistance on all phases of its projects. It is believed that their use throughout the industry will be widespread in a few years.



Model is ready for customer approval. Up to this point only rough sketches are required. The model will be used by the customer to train operating personnel prior to completion



Project model represents an integrated engineering-drafting-model-maker design approach

General view of the convention registration area at the Fairmont Hotel in San Francisco. More than 2,000 were registered

High technical interest gives broad appeal to

AIEE Summer Convention Program

San Francisco's scientific, scenic and industrial attractions, plus an excellent program of broad technical interest, drew over 2,000 in attendance at the annual Summer and Pacific General Meeting of the American Institute of Electrical Engineers. Conventioneers, in addition to enjoying a full week of technical sessions, availed themselves of opportunities to visit the University of California Radiation Laboratory, Pacific Gas and Electric Co.'s Pittsburg steam plant, the United Air Lines maintenance base, the San Francisco Naval Shipyard and the Bay Area manufacturing facilities. Recreational opportunities were also popular, a feature of this year's convention being a salmon fishing derby which took eight boatloads of anglers out through the Golden Gate to try their luck on the salmon runs near the Farallon Islands. Limit catches were made.

At the annual meeting of the institute on Monday, June 25, President M. D. Hooven of the Public Service Electric & Gas Co. of New Jersey officially relinquished control of AIEE affairs to incoming President M. S. Coover. Coover is associate dean of engineering and professor of electrical engineering at Iowa State College.

In accepting the president's badge, Coover told the convention that as long as world tension continued to exist we must continue to move at a high pace in every facet of our existence, trying always to steer a proper course. He called upon all who have had specialized training in various areas to exercise the influence of their knowledge in helping to guide lawmakers and public officials.

A feature of the opening session was the presentation of the Lamme Medal to Dr. Clinton R. Hanna, associate director of research, Westinghouse Electric Corp., East Pittsburgh, Pa. The award, established by the late Benjamin G. Lamme, former chief engineer of Westinghouse, was made to Dr. Hanna for his fundamental calculations and developments in the field of electrodynamics and particularly for his achievement in the design of generator voltage regulators, automatic rolling mill controls and tank gun stabilizers.

The five-day technical sessions featured papers by prominent Western engineers.

Power Generation

The north fork of the Kings River development by Pacific Gas and Electric Co. will develop more than a mile of head; include installation of the largest vertical shaft impulse turbines in the U.S.; an underground power house; a high-head penstock crossing under the river; two rock-fill dams; unlined pressure tunnels; and automatic operation of the chain of plants. The project was described by W. R. Johnson, D. P. Dinapoli and J. B. Cook of PG and E. (Conference paper (CP) 56-785.) Two high dams will provide 230,000 acre-ft of storage. Output of three plants will be 296,000 kw. Completion is scheduled for 1959-61. Haas will have a head of 2,444 ft, rebuilt Balch 2,389 ft, and Kings River a head of 793 ft.

Each plant will be arranged for automatic start-up under normal conditions with protective features to shut down and lock out in case of serious trouble in the plant. Restart after shut down for lesser troubles will either be automatic or by supervisory control.

Outdoor Steam Plants

Outdoor vs indoor steam plant design with reference to first costs and maintenance of electrical equipment was covered by Einar Nilsson, PG and E. (Paper No. 56-768.) Pittsburg steam plant experience was used for purposes of comparisons. Although the factors favorable to the outdoor station result in a lower cost station electrical plant, it must be recognized that the greatest portion of the reduced over-all cost in an outdoor station of the Pittsburg design lies in the building structure and high-pressure piping. It is noted that, with an over-all cost of $106/kw of plant capacity for this station and with the cost of auxiliary electrical equipment, including motors, of $9/kw, both of these cost figures are less than the same cost figures for re-

cent indoor plants. It is expected that the outdoor steam plant design will be repeated where practicable on the PG and E system.

Plant Design Refinements

In a paper (CP 56-771), J. L. Cohon, Southern California Edison Co., concludes that provision of special sources of generation for station auxiliaries is no longer considered necessary on the Edison system. With growth of the system the relative importance of an individual plant decreases proportionally; likewise the dependability of the system as a source of auxiliary power increases. Also, when considering equipment for use on stand-by service or as spares the quantity can be restricted to an amount or size sufficient for one unit's replacement, as long as this equipment is arranged for common use between units or stations.

Transmission Planning

Washington Water Power Co., as one of the four utilities comprising the Pacific Northwest Power Co., was assigned the transmission study for a 1,446-mw hydro project on the Snake River. Results were reported by W. A. Morgan, G. R. George, R. C. Guse and M. F. Hatch, all of WWP, in paper CP 56-709. Investigation covered line voltage, conductor size and structure design. Conclusions reached were: economics of large conductor show that 1,272 instead of 795 MCM ACSR conductors on 230-kv lines are justified for peak loads of 150 mva and higher; that the economic loading curves for either conductor are relatively flat about 150-200 mva; 230 kv, rather than 345 kv, proved to be the optimum voltage for most of the lines; 345 kv is feasible for the single 288-mile line to Portland; two 757 MCM ACSR conductors arranged in a bundle would be more economical than a single 1,780.7 MCM ACSR conductor for the 345-kv Portland line; by reducing average spans to about 500 ft, wood pole H-frame structures show definite economy for the 230-kv lines and will satisfactorily carry the 1,272 MCM ACSR conductors by increasing the arm strength and guying; however, savings would not justify wood poles in the case of 345-kv lines.

230-Kv Line Design

To lower construction costs, several modifications in previous designs were made for the 205-mile, 230-kv, Big Bend-Granite Falls transmission line of the Bureau of Reclamation, said T. M. Austin, USBR, in paper CP 56-708. Insulation was reduced from 16 to 14 disks per suspension string, permitting smaller coordinating clearances and reduction in the size of steel towers; loading assumptions for suspension towers were reduced; only one overhead ground wire instead of two is used; maximum tension under heavy loading conditions was increased from 12,000 to 13,000 lb for the 954 MCM ACSR conductor, resulting in slightly shorter towers; ruling spans of 1,320 ft were used. Design changes resulted in an estimated saving of 25% compared to similar lines of previous design.

Aluminum-to-Copper Connectors

Background and evolution of a new, safe means of joining aluminum-to-copper conductors that is suitable for application to all exposed circuits in any natural environment was the subject of paper No. 56-721 by E. W. Greenfield and A. H. Selker, Kaiser Aluminum & Chemical Corp., Spokane. Nucleus of the idea for an ideal connector lies in the formation of a safe transition from aluminum to copper metal. This transition can be made by butt joining the closed ends of two tubes of the metals and suitably sealing the boundary line. Attachment of the respective conductors to this transition fixture can be made in a variety of ways—in compression barrels, with bolting members or even soldering, brazing or welding. Results of extensive laboratory and field tests for the new ALCUnectors are given in the paper.

Conductor Economics

R. C. Blankenburg, Southern California Edison Co., presented a chart relating watts, ohms, amperes and dollars for determining conductor costs vs loss costs. (Paper CP 56-704.) The need for frequent review of current ratings that afford best economy makes it desirable to have facilities and expedite such reviews. The method of analysis is based on differences in costs (incremental costs) that will eliminate most if not all likely errors as to which are the true variables when making determinations where only certain variables are significant.

Economics of Hydro Storage

Use of a digital computer of the IBM 604 type for determining the economical use of hydro storage was described by David L. Johnson, University of Washington, in paper No. 56-677. The system used in the study was that of Seattle City Light. Solution of the problem involving economical use of hydro storage is one that lends itself well to digital computer solution. Computer application should be more than the mere mechanization of methods previously used, but require a re-examination of the basic problem in terms of the most elementary mathematics and theory, states the author. Total solution of the storage problem for Seattle City Light for the contract-year using the IBM 604 requires less than an hour. Average error was 0.05% with maximum error of less than 1.5%. For solution of more complex problems it would be advisable to use a high-speed digital computer with larger storage. Further experience with a larger computer will permit improvement of the method of solution.

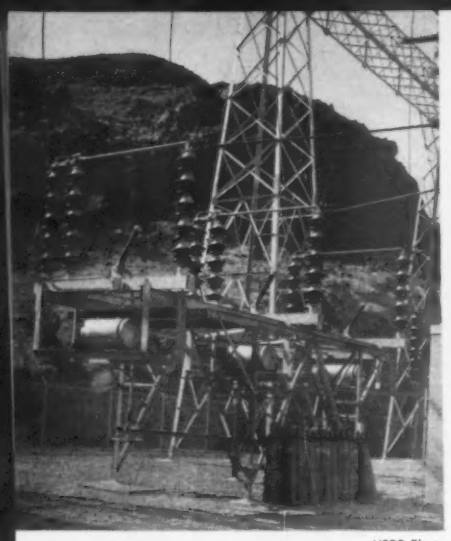
Penalty Factors

When transmission losses are taken into account in the economical allocation of generation among stations, it is necessary to have an equation, or equations, that a power system must satisfy at all times. At present an approximation of such an equation is deduced from the principle of the conservation of energy. A more natural approach is to attempt to derive an implicit equation for a power system directly without first finding an expression for the losses. A paper by P. G. Lubisich (CP 56-671), Los Angeles Department of Water & Power, derives parametric equations and uses them to obtain expressions for the penalty factors applicable to generating stations.

Generation Reserves

The prominence of generation reserve in economic studies of system generation requirements emphasizes the need for a systematic mathematical derivation of these reserves. Use of the

AIEE's new president, M. S. Coover, received the president's badge from retiring President M. D. Hooven



USBR Photo

230-kv gas blast disconnect switch tested at Hoover Dam. Tubes directing the blast on each of three phases are clearly visible

probability method to meet this need was described in paper CP 56-635 by Carl Kist and G. J. Thomas of the Los Angeles Department of Water & Power.

High-Voltage D-C Testing

E. C. Schurch, Bureau of Reclamation, reported in paper No. 56-633 that high-voltage d-c insulation tests have been made or are planned on all bureau power plants, pumping plants and substations involving 30 plants, totaling approximately 4,000,000 kva of synchronous capacity and varying in age from new to 47 years. The high-voltage d-c test is favored over other types of test because of the nondestructive nature of the test and the excellent results obtained by its use. The paper contains much valuable information on the d-c test method, using tests at the Shasta power plant to bring out important points.

Gas-Blast Switch Tests

Results of tests on a gas-blast, air-break 230-kv switch (shown) were reported in paper CP 56-753 by P. E. Richardson, Bureau of Reclamation, and Arem Foti of the I-T-E Circuit Breaker Co. The gas-blast attachment is mounted on a standard air switch. Tests made at Hoover power plant included interruption of transformer magnetizing current, parallel load current and line charging current. Results showed that a 230-kv gas-blast switch is capable of successfully interrupting the magnetizing current of a 112,500-kva transformer bank, and much larger; is a useful device for interrupting parallel load current and line charging currents for the conditions tested; the length of arc and reach of arc were greatly reduced as compared with performance of a conventional horn gap switch. The test program has proved the 230-kv gas-blast switch to be an economical means of isolating transformer banks, switching small blocks of parallel load current and for dropping as much as 84 miles of 230-kv line.

Tie-Line Bias

A new approach to the theory of tie-line bias control settings for interconnected power systems was presented in a paper by Nathan Cohn of Leeds & Northrup Co. (CP 56-670). Data contained therein should be of particular interest to system operating people because the paper develops and extends theoretical criteria that will be helpful in providing a broader and fuller understanding of the bias concept and its application. Basically the paper examines the effect of bias settings on frequency, tie-line power flow and regulation within an area when there is a remote step-function load or generation change. Included are equations, believed to be new, which establish the quantitative relations of these effects as functions of different sizes of the disturbance area, different relative load and generation characteristics, different amounts of generation subject to bias regulator action, and for bias settings equal to, smaller than, or greater than the prevailing area governing characteristic. The equations developed show the effects of bias settings above and below that setting which matches the prevailing natural characteristic of the area.

Current-Limiting Fuses

Characteristics of current-limiting fuses and their applications were covered in paper No. 56-772 by P. C. Jacobs, Chase-Shawmut Co. The author states: "Current-limiting fuses have been developed and are commercially available to provide economical circuit protection with adequate interrupting ability and sufficient current limitation to protect the largest systems that are being designed or are forecast for the future. Current-limiting fuses are being manufactured with standard current ratings from 1 to 6,000 amp, standard voltage ratings up to 600 v and with interrupting ratings up to 200,000-rms symmetrical current. Still higher ratings are available for special applications." The paper gives in detail the theory and operating characteristics of this type of fuse and sets down the information required for their proper application.

Coordination of current-limiting fuses and low-voltage air circuit breakers was covered in paper No. 56-773 by M. S. Carlson and W. H. Edmunds of the I-T-E Circuit Breaker Co. These conclusions were drawn: true current-limiting fuses can be used to protect low-voltage circuit breakers, both thermally and mechanically, from fault currents far in excess of the circuit breaker's interrupting rating; good time-current coordination can be obtained between the fuse and circuit breaker in both the overload and fault current ranges; the use of current-limiting fuse-circuit breaker combination gives a new method of effecting economies in distribution systems.

Space Heating—Heat Pumps

Load characteristics for a 20-suite electrically heated apartment house in Vancouver, B. C., using load regulators to minimize heating demands, were given in paper CP 56-690 by J. C. McAdam, B. C. Electric Co. Tests developed the following information: heating load factor during test period, 26.4%; nonheating load factor including water heating, 53.6%; nonheating load factor excluding water heating, 33.4%; over-all load factor, 36.7%. From the study it was concluded that electric heating in an apartment house is not as desirable a load from the utility's standpoint as lighting and cooking, or lighting, cooking and water heating. From a previous similar study on an 8-suite electrically heated apartment with central electric water heating, but not having load-limiting relays installed to minimize heating load, an annual over-all load factor of 20.4% was obtained. Although this 8-suite building would not have the same diversity as a 20-suite building, the difference in annual load factor between 36.7% and 20.4% seems to indicate the value of load limitizers in minimizing peak demand and thus in increasing load factor.

In paper CP 56-691 on the design and operation of an air-to-air heat pump air conditioning system, H. E. Burrier, Southern California Edison Co., drew these conclusions: air-to-air heat pump air conditioning systems ranging in size from 5 to 25 tons have been successfully designed and constructed using commercially available components; it is possible to design and build such a size having a coefficient of performance of more than 3 while operating in the heating cycle; such a system requires no more maintenance than a conventional refrigeration air conditioning system—even less in many cases.

Pilot Wire Relaying

Detailed information on methods for protecting pilot wire relay circuits was

provided in a report of the Pacific Coast subcommittee of the AIEE committee on relays. The paper, CP 56-632, emphasizes the need for greater attention to the detail of pilot wire protection, particularly because of the increasing use of this method of protecting short transmission lines. While the paper states that the simplest and best assurance of correct pilot wire relay operation is the use of adequately transposed pilot wires fully insulated against all hazards, it suggests more economic pilot wire construction through the proper application of protective features such as neutralizing reactors and transformers, gaps and lightning arresters.

Reduced BIL

P. L. Bellaschi, consulting engineer of Portland, Ore., outlined the problems of reduced insulation in power systems at higher voltages. In paper No. 56-732 he discussed the coordination of station insulation to impulse, switching and 60-cycle conditions. In the author's opinion, the present reduced basic insulation levels as now applied in power systems operating with the neutral solidly grounded are generally well coordinated to impulse, switching surges and 60-cycle requirements. However, further reduction does not appear to be realistic at the present time because of the limited practical operating experience at present BILs. He suggested that a basic consideration requiring attention, especially at higher operating stresses, is the performance and endurance of insulation to continuous 60-cycle operation.

Emergency Lighting

Failure of lighting has been a major contributing factor in many of the notorious fires of the past 50 years where major loss of life has occurred, said Robert S. Moulton, technical secretary of the National Fire Protective Assn. (NFPA) in presenting a paper (CP 56-761) on emergency lighting for fire safety. Public utility systems have a high degree of reliability and provide a satisfactory source for exit lighting for the great majority of buildings. However, they are not infallible, and moreover, lights often fail because of electrical faults within the individual building. The situation is such as to call for some type of emergency lighting system to assure continuing illumination sufficient for the safe evacuation of theaters and other places where large numbers of people congregate.

In discussing Moulton's paper, A. B. Smedley, consulting engineer, Pasadena, pointed out the inadequacy of emergency lighting systems, not only for public gathering places but importantly also in industrial plants. He described briefly a new emergency lighting system soon to be placed on the market that, in his opinion, overcomes the inherent weakness of all existing systems. This system will be described in a forthcoming paper.

J. S. Moulton (left), general convention chairman; San Francisco's Mayor Christopher who welcomed the conventioneers; Bradley Cozzens of the Los Angeles Department of Water & Power, AIEE vice-president; and D. I. Anzini, vice-chairman of the convention

Transformer Loading

An interesting paper by Southern California Edison's A. Klopfenstein proposed that power transformers be loaded to obtain minimum annual cost per kva. He suggested a method for computing annual depreciation cost due to thermal aging and showed that depreciation becomes a large proportion of total cost as peak loading is increased. The method proposed should be helpful in selecting transformers for new stations or predicting when existing transformers should be replaced because of load growth.

The author recommends continuous collection of data pertaining to costs, including depreciation, as related to load and that loading guides for transformers should be changed continually as prices, taxes, interest and insurance rates vary. Between good loading guides and sound aging predictions for transformers, economies in system operation, such as the reduction of spare capacity and minimum over-all cost for transformer operation, can be effected. (Paper No. 56-628.)

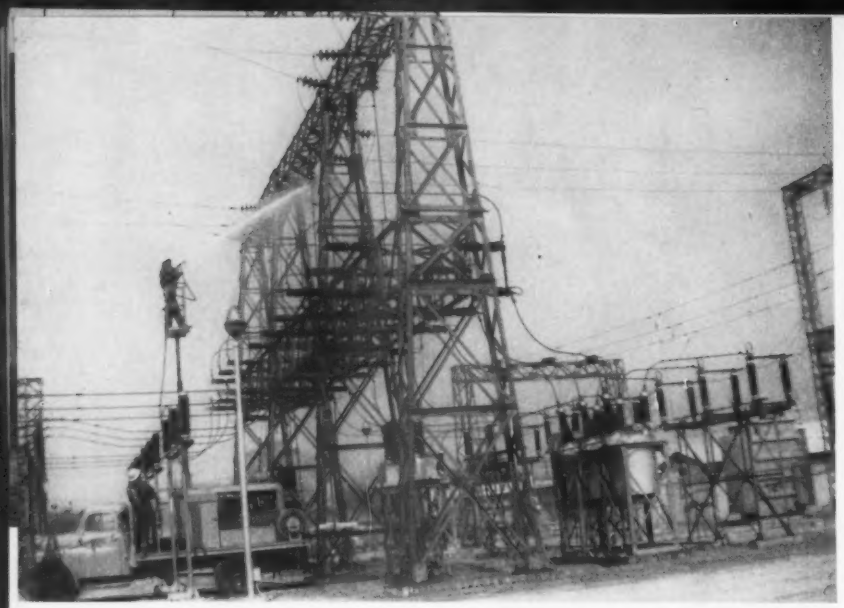
New Fault Equations

M. J. Lantz of the Bonneville Power Administration presented a simplified method for calculating intermediate faults on mutually coupled transmission lines. His proposed method, which is readily adaptable to the desk calculator or electric computer, reduces complicated calculations for intermediate fault points along mutually coupled transmission circuits bused at each end to a routine form. (Paper No. 56-629.)

Var Economics

An economic study of var supply to a large electric power system was presented in paper CP 56-710 by T. A. Bettersworth of the PG and E. The object of this analysis was to determine to what extent it would be economical to reduce the var flow from transmission to distribution by the installation of shunt capacitors on the distribution system. On the system study, the major portion of the var generating capacity was in the transmission system while most of the var consumption was in the distribution system, the transmission system supplying approximately .42 var per watt to the distribution system. Assumptions made in the study included an annual cost to supply incremental kvar from distribution capacitors (including cost of money, taxes, depreciation, maintenance and operation) which was set at 15% of investment, or $1.22 per kvar. Annual costs for power and energy losses at the input to the subtransmission system were considered to be $27 per kilowatt for losses at system peak and 2.8 mills per kilowatt-hour.

On the basis of Bettersworth's studies, a system average power factor of 94.3%, measured at the distribution feeders, was economically justified on the basis of incremental energy loss savings alone. If the cost of generating and bulk transmission capacity to supply incremental peak power losses is considered, a distribution power factor of 99.1 is economically justified. He concludes that long-range economics



Insulator washing on the Southern California Edison system as described in R. S. Melville's paper at the summer convention

will justify a distribution power factor of approximately unity.

Dips and Flicker

In discussing the ever-present problem of voltage dips and flicker, A. A. Kroneberg of the Southern California Edison Co. suggested that closer cooperation between the designers of industrial plants and utility engineers would be desirable in order that extensions could be properly dimensioned to give adequate service to the customer and prevent disturbances to other users. There is also need to educate designers of industrial control systems and automatic machines to the fact that a continuous and uniform voltage supply from the utility system cannot be assumed. Mutual understanding, he stated, between industrial and utility engineers of each other's problems would go a long way toward helping improve service to everyone. (Paper No. 56-637.)

Insulator Cleaning Practice

Periodic washing of outdoor equipment with a stream of water from a fire hose is preferable to hand wiping each time that insulators require cleaning, concluded C. L. Collins and J. H. Rutter, Los Angeles Department of Water & Power, in their paper CP 56-760 on cleaning insulators in energized substations. Factors considered in arriving at this conclusion were economy, service reliability, general appearance and safety. Techniques, equipment and frequency of washing were fully covered. It was noted that in washing insulators, bushings, etc., on energized equipment ranging in voltages from 287.5 kv down to 5 kv very few flashovers have occurred.

History of insulator washing at substations and practices of the Southern California Edison Co. was covered in paper CP 56-739 by R. S. Melville of that company. He summed up his discussion by saying that judicious use of insulator washing equipment and techniques has developed a safe, economical and practicable insulator cleaning procedure for substations of the Edison company. It should be emphasized, he said, that washing is not the only answer to the contamination problem. Insulator coatings such as the silicone waxes and greases may make great changes in insulator maintenance. However, the success of the washing program is encouraging and it is planned to extend the use of the tested and proved washing methods (high-pressure water stream is used—Ed.)

Microwave System

A paper by G. D. Perry Jr. of the Southern Colorado Power Co. and Eugene Langone of the General Electric Co. described the microwave system installed by the former company in paper No. 56-630. The system consists of voice communication, relaying and supervisory control channels and was selected primarily for its reliability and capabilities for future expansion.

Transfer Trip Relaying

Tests on the Bonneville system, together with the experience in other countries, indicate that transfer-trip type of carrier relaying is a simple, reliable method of relaying and warrants consideration for additional installations. This conclusion was reached by A. W. Adams, Bonneville Power Administration, in a conference paper. He described tests on a 230-mile, 287-kv line with 230/287-kv autotransformers at each terminal with OCBs on the low side only. Carrier is of the narrow-band, frequency-shift type and is used for transformer internal fault protection and line faults. Adams said that as a result of the tests BPA plans to extend this type of relaying, including some 345-kv circuits. Adams said manufacturers should be encouraged to design carrier equipment especially for transfer trip relaying.

Transistorized Distance Relay

The intriguing possibilities of transistorized relays to supplement and possibly replace the vacuum-tube types were discussed in a conference paper by F. R. Bergseth, University of Washington. Among advantages mentioned were greater potential reliability (very important), freedom from the constant heater drain on station batteries, possibility of independent battery supply, present availability of suitable types, and small physical size and low heat dissipation. The author described a laboratory test setup at the university and reported that the transistorized distance relay performs at least as well as the vacuum-tube type. Actual service experience is needed but no weaknesses of theory or design are yet apparent from the laboratory testing.

Computers for Transformer Design

An eastern paper (56-742) described the use of computers for determination of impulse stresses within transformers. Both digital and analog computers were used as a method that lends itself to more complete automation in the design of transformers.

Committee

The convention committee, headed by J. S. Moulton, vice-president, Pacific Gas and Electric Co., included D. I. Anzini, General Electric Co., vice-chairman; J. C. Beckett, Wesix Electric Heater Co., hotels; A. D. Bragg, G-E, entertainment; I. W. Collins, PG and E, inspection trips; W. G. Collins, Pacific Telephone & Telegraph Co., transportation; Prof. C. F. Dalziel, University of California, students; W. L. Carter, PT&T, secretary; W. F. Poynter, Federal Pacific Electric Co., treasurer and finance; O. A. Gustafson, G-E, sports; F. J. Kovalcik, McGraw-Hill Publishing Co., publicity; J. A. Longley, Allis-Chalmers Mfg. Co., arrangements; R. H. Miller, PG and E, general program; E. F. Sixtus, Federal Pacific Electric, registration; Mrs. J. S. Moulton, ladies entertainment.

Different Convention Promised IAEI

An overhauling and streamlining of the program and procedure promises to make the annual meeting of the Southwestern Section, International Association of Electrical Inspectors, at Hotel Claremont, Berkeley, Sept. 17-19, a new and profitable adventure for all who attend. This was expressed by E. E. Carlton, California State Division of Industrial Safety, who has charge of the program. James L. Ambrosi, Oakland city inspector, section president, has declared it a workshop instead of a sit-and-listen type of meeting.

Always intent workers from breakfast sessions to late afternoon, the inspectors will find the change to their liking. All of the preliminary introductions and reports of chapters, section and committees will be eliminated but put in the record. The real work session will start immediately on Monday morning.

Only three talks are scheduled besides a brief report from the IAEI headquarters. Two of these concern new developments of which the inspectors should be informed. The third concerns a grave problem.

The new Cypak system of Westinghouse will be described by Carl Spain Jr. to inform inspectors regarding it, should they find applications in their field.

Another new development, the IBM carrier current system for operating relays, will be described by Michael J. LaFaurie of IBM, San Francisco. This system imposes high-frequency and high-voltage impulses over the building wiring system to operate relays and controls.

The problem of fractional horsepower motor fires, from which the reports show most electrical fires are caused, will be discussed by Victor B. Vaughan of the Spencer Thermostat Division who will discuss Art. 430, relating to overcurrent protection for motors.

The main work of the meeting will be done in three two-hour sessions of conference type in which electrical inspectors themselves will participate far more than in previous meetings. These are being organized by Barney Alverson, San Bernardino County inspector, and will involve inspection techniques and public relations. Subchairmen will be in charge of sessions on residential, commercial and industrial wiring.

The meeting will contain at least one code breakfast session, a banquet on Tuesday evening, two luncheons with speakers or programs of general interest.

D. D. "Pat" O'Leary had been named general convention chairman but relinguished the post on being appointed Berkeley's superintendent of electricity. President Ambrosi named John Thompson as his successor.

Nevada Chapter, IAEI, had an attendance of almost 100 registered for its annual meeting in May. It started with a breakfast code session of which J. Hyde Stayner, Salt Lake City, was chairman and the panel consisted of Henry Etchemendy, Elko, and Tom Moltzen, Reno. The business session was presided over by Charles LeClare, Reno electrical inspector. Secretary was Francis Wells of Demody Electric Co., Reno. Larry Trim, Burbank, IAEI president, and James Ambrosi, Oakland, president of the Southwestern Section, participated. Others on the program were: Howard Lindsay, Winnemucca; Harry Adams, Reno; Herb Ufer, Los Angeles, honorary president of IAEI; Jack Harker, Reno; W. W. Murdock, Elko; Emmett Markell, Las Vegas; Ray Couch, Fallon; John Dermody and Jody Henderson, Reno; Frank Bacigalupi of Nevada Industrial Commission; Harry Linneck, Reno. Frank Falge presented the Live Better . . . *Electrically* program. A. L. Pierce, Sierra Pacific Power Co., Reno, was toastmaster at the banquet. One topic that was prominent was a proposed state inspection law. Manufacturers also conducted an exhibit of electrical materials and devices in the meeting hall.

IEA

New chapters are in the making for the Intermountain Electrical Assn., according to its energetic president, Ernest D. Schettler, in discussing the program for the year. A new chapter is being formed in Roosevelt-Vernal district and another, which may be known as the Southern Utah Chapter, is contemplated in Cedar City. Other chapters are being discussed at Idaho Falls-Rexburg district, which the Utah Power & Light Co. serves. Schettler plans to make all chapters at least three times in his year as president.

The possibilities of forming a Certified Lighting program are being studied by a committee headed by Jim Hamilton of Artistic Lighting Co., according to Robert O. Trottier, managing director of the IEA. With one of the originators of the idea back of "Operation Home Improvement," a local builder, an effort was made by this league to buy an old home and remodel it as a demonstration of what could be done in modernizing it. This project was later dropped. However, activity on the Live Better . . . *Electrically* program and also on Housepower will also include the Operation Home Improvement idea.

Good coverage of the State of Utah and parts of Idaho was given to the films and all contractors are encouraged to use the slogans and so identify themselves with the program. The Housepower program of the IEA is headed by R. E. Bartlett, a contractor, who is chairman of the contractors' division. Last year there were certified 355 homes. In 1954, only 285. Ogden alone certified 44.

PCEA—Hawaii

Fifty representatives of Island utilities and sugar plantations recently met for a one-day PCEA workshop meeting on the Island of Maui. In addition to two panel sessions, one on system operating practices and the other on secondary wire size, a principal paper on economical loading of generating equipment was given by F. R. Montgomery of the Hawaiian Electric Co. Montgomery gave the basic principles involved in determining the most economical loading of two generating sources, several sources, including transmission, and showed how a family of curves is made for dispatcher's use. C. H. Williams is chairman of the E & O Hawaiian Section, PCEA.

APDA

The American Power Dispatchers Assn. will hold its Southwest Area meeting in Pasadena July 13. N. Cohn will discuss "The Philosophy and Practices of the Control of Interconnected Power Systems." It will be held at the Pasadena Elks Club.

ESL

Electrical Service League of B. C., Victoria Division, held a public educational meeting on Denman Island recently, addressed by S. Carlson, who spoke on "Modern Appliances Need Modern Wiring" and showed films. John Gardner, manager, B. C. Power Commission, of Courtenay, B. C., told of the rates and cost of operation. At a meeting May 17 in Sooke, B. C., Carlson spoke on "The Wiring Pathway," A. Hall of "Agricultural Aids" and Mrs. N. Graham made laundry demonstrations. **Mid Island Electrical Assn.** at Nanaimo, B. C., held a recent meeting addressed by R. Hall, liaison officer from the Vancouver Electrical Assn.

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ELECTRICAL WEST

Atomic Insurance

HEARINGS before the Congressional Joint Committee on Atomic Energy during the past several weeks have pointed up the insurance problem for investor-financed nuclear power plants. Reports from Washington indicate that action on a government-backed indemnification program is likely before Congress adjourns this summer. Such a move would not necessarily speed up the reactor development program by private agencies, for that program is moving along with vigor primarily on the assumption that public liability insurance will be available by the time the first reactors are ready to go into operation. Aid from the government on the insurance problem, however, would speed the time when the costs and amounts of insurance coverage could be firmly established.

In some respects, an insurance indemnification program by the federal government would follow the partnership principle of the present administration. Underwriters indicate that the job is just too big for any single group of insurance companies. At present, the insurance industry says that it can offer up to $65,000,000 coverage as a maximum for any one accident. Conversation in Washington both by members of Congress and the utility industry seems to indicate that a $500,000,000 ceiling per accident would not be too great in case of an industrial atomic catastrophe.

It is reported that most joint committee members apparently favor the $500,000,000 ceiling with the government assuming the liability for damages above those underwritten by the private insurance companies. In the unlikely event that the damage would exceed $500,000,000, the present theory is to prorate the total available insurance from both private companies and the government among damage claimants and to ask Congress for special legislation to cover losses in excess of the protected statutory maximum.

At the present time a government-supported insurance program should be looked upon as something of a transitory nature until such time as reactor operational experience will give the insurance companies some reliable statistics on actuarial probability. It is not beyond the realm of possibility that public liability insurance rates may be sufficiently high to be a large determining factor in reactor plant location. It is to be hoped that the attitude of Congress on this important subject can be made known before adjournment.

Parenthetically, the need for government insurance to supplement private coverage is being used as a major prop by the supporters of the Gore bill (to build six federally owned nuclear reactors). They point to requests from utility industry spokesmen not only for federal insurance aid, but also for tax concessions and for exemptions from the utility holding company act as calling for so much government assistance that the federal government might as well take on the entire responsibility and develop its own "crash" program to prove to the world the United States leadership in nuclear progress. Competition being what it is, if the question of insurance could be resolved satisfactorily, it could be expected that the forces of free enterprise would create a crash program of nuclear development of their own—and without cost to or discrimination against any part of the taxpaying public.

Ceiling for Expenditures

THOSE attending the 24th annual convention of the Edison Electric Institute were treated to the spectacle of a congressman standing up and calling for legislation to insure a balanced national budget—year in and year out. The Hon. Frederick R. Coudert Jr., congressman from New York State, told the meeting that Congress needs protection against pressure groups. These pressure groups, he said, "one day push us to spend, the next day push us to reduce taxes."

He recommended the principle that tax receipts shall determine expenditure levels, that spending beyond the national income be made unlawful. He called for positive action, preferably in the form of a constitutional amendment. The dangers of deficit spending in peacetime were emphasized par-

EDITORIAL VIEWS

ticularly in the talk. And the lack of positive congressional control over spending, as outlined by the speaker, was revealing and significant. The present system makes it so easy for the government to borrow and to go further into debt that Congressman Coudert sees the need for immediate corrective action.

It might be a very good idea to ask the American people if they want to have their government on a pay-as-you-go basis. The idea ought to have wide popular appeal. After all, the citizens themselves have had to learn to live that way. There's no reason why they shouldn't want their government to do the same. It's interesting to speculate on the poiltical approach that the lavish spenders, the do-gooders and the vote buyers would take if they had to ask to vote for higher taxes every time they hatched a new idea for tapping public funds.

Safety Move

THE Los Angeles Bureau of Power and Light is one of the first utilities to take advantage of the safety features now available to minimize the personal hazard of modern driving. In its recent fleet purchase of 68 new passenger cars, the department backed up several years of research and experimentation by specifying five items of safety equipment.

The new sedans are equipped with seat belts for both driver and passenger in the front seats, the new type safety steering wheel designed to protect the driver from injury by steering column in the case of collision, safety door latches on all four doors, padded dash board and sun visors and ball-swivel mounted inside rear view mirrors which deflect easily under impact.

The Los Angeles utility has had a long record of pioneering in driver training and fleet safety operation. But even the best of safety programs cannot prevent all traffic accidents and the decision to incorporate safety features on new mobile equipment cannot help to lessen the severity of injuries for those accidents listed as "unavoidable."

Utilities generally are well in the forefront of those organizations who preach and practice safety. Equipping cars and trucks with every safety device possible is merely another way of emphasizing the policy of "safety first." That safety features on automobiles can lessen the severity of accident injury is an established fact. If enough organizations and enough people demand them it will not be long before all will be standard equipment.

Green Light for Business

"WITH present long-range plans for research, new products and capital spending, it is entirely possible that the years 1955 and 1956 will turn out to have been only a start of another great surge in business activity." This statement from the McGraw-Hill department of economics is based on its most recent survey covering business plans for new plants and equipment for the years 1956 through 1959. The figures it produced represent unusually strong business confidence in the long-term future of the country's economy.

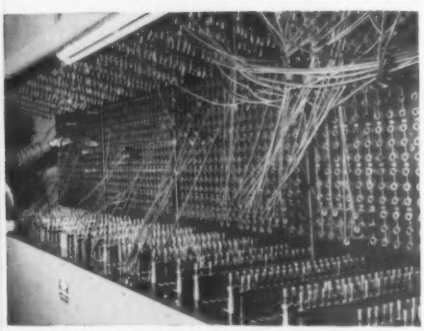
Capital expenditures by industry are always a major prop in the economy. The survey shows that U. S. business now plans to spend almost $39 billion for new plants and equipment in 1956. This is a 30% increase over the spending in 1955. Better still, the most important feature brought out by the survey is the high level of expenditures already planned for the three following years. For the first time since the surveys were started, plans for capital expenditures two years in advance are equal to those for the current year. Moreover, plans for three and four years ahead are already within shooting distance of the current level, with 88% of the companies able to give specific details on expansion as far ahead as 1959.

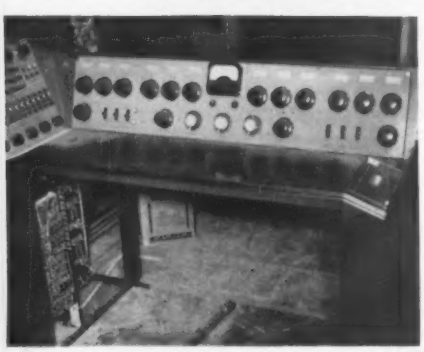
Manufacturing companies intend to increase their productive capacity 26% in the years 1956 to 1959, inclusive. This same group expects 11% of its 1959 sales to come from new products not even made in 1955.

In the fact of such evidence of business vitality, it is almost impossible to be pessimistic. Rather it should make every businessman have an irresistible urge to obey that impulse and climb on the band wagon.

Built from the ground up for television is NBC's Color City, Burbank. Color demands more individual control of a loft full of light units

NBC Color City—What It





A color television set in the home may appear to be a complex package of electrical components but consider the studio from which the telecast originates. It is an incredible complex of electrical equipment and no mean job of wiring. The NBC Color City, as its West Coast headquarters for network color are called, in Burbank, is just such an electrical installation. Through arrangements made by Larry Trim, Burbank chief electrical inspector, and the cooperation of NBC officers, this glimpse behind the scenes and into the electrical nerve and artery system is possible.

The NBC television center began, on a 48-acre site in Burbank, as a pair of black and white studios with a service corridor connecting them. With the advent of color TV the 90x140-ft color studio, 42 ft to lower chord of roof truss, was added and a technical wing, dressing room wing and service buildings also. Tilt slab concrete construction was used. Austin Co. was general contractor; Fishbach & Moore the electrical contractor. RCA Engineers F. G. Connolly, J. A. Edmonson and Project Engineer J. G. Strang were closely associated with the entire job.

Upper picture, during construction, the lighting bridge in black and white studio with master controls at left overlooking stage and banked Rotolector dimmers at right. Scenes can be preset here and individual circuits connected on patch board shown in center picture. There are some 1,260 lighting outlets and 2,400 controls in each studio. Bottom picture is of the sound-mixing console during installation. Audio control room is sound insulated but adjacent to directors' control room

Power is taken from the city of Burbank at 4,160-v primary from two sources to provide emergency service, with automatic transfer switching in case the preferred source has an outage. Distribution in the buildings is at 120/208, three-phase, four-wire for stage lighting and studio power. The main switch is 4,000 amp capacity for studio lighting and power. There is an 800-amp breaker for the general building lighting and the emergency panel has 200 amp capacity. Amp traps are used on the tie between the general lighting and the emergency lighting board. Bus duct runs along the basement ceiling to feed from the main switchboard to the distribution centers in each studio or auxiliary building.

Stage and studio lighting is expected in such a job, but the air conditioning system is another important electrical feature. Approximately 200 tons of refrigeration are required to maintain the 75 F temperature within the studio for actors, staff and studio audience comfort when the outside temperature is 95 F. Another 170 tons are required to remove the heat from the intense lighting required for color television. Another 80 tons cool the technical areas and their transmitting equipment. This totals 450 tons of refrigeration supplied by two 225-ton Worthington centrifugal compressors operated on variable speed control by 250-hp motors, automatically actuated by the temperature of the chilled water supplied the air handling units. These deliver 110,000 cu ft per minute of cooled or heated air as needed.

Stage lighting in the color studio differs from that in the two black and white TV studios, in that the battens for the overhead lighting in the color

Director and mixers edit what goes on the air from four cameras. Stage, audience seats, light bridge (right) of black and white studio

Takes to Telecast Color

studio use no strips of border lights. Instead they are loaded with individually controlled and aimed floods, spots and banks of lamps. All lighting equipment on the stages uses incandescent lamps to eliminate radio interference. Fluorescent lighting is used in the offices and other buildings only. In the black and white studios the 17 rows of border lights have the usual three color combinations individually controlled, besides battens for spots, etc.

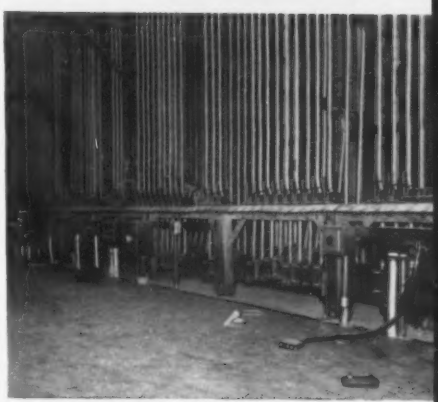
Lighting control is centered at a lighting bridge along one side of the studio and above the floor. In the color studio is placed a Century Izenour dimmer board containing 140 dimmers of 5 kw capacity. The black and white studios have a Kleigl-Ward Leonard Rotolective 50-amp dimmer system. In either case, dimmers are operated from the control console. This board also controls 50 nondimmed circuits. With this equipment 10 scenes can be preset and faded from one to the other by pushing buttons. Or six master groups can be assigned to one dimmer handle. Functionally, the dimmer board is split in half with each half independently operable. This permits two small shows to be set up independently.

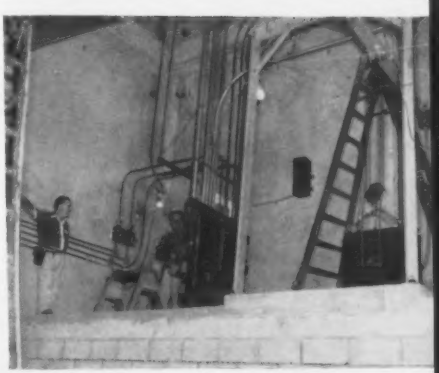
The video and audio control rooms are located on alternate sides of the monitor room overlooking the stage wherein the directors and the mixers operate. Complete telephone communication is maintained between all cameramen, directors, lighting control console and all who may be involved in a scene or even from the network. There is a nine-unit duct between the studios and Hollywood for interconnection.

Instead of stage pockets common to the theater, power for moving the portable cameras and cranes, as well as any portable lighting or electrical equipment on stage, is supplied from outlets along the pin rails where the scene and lighting battens may be raised or lowered. This gives the camera dollies more freedom to roam the stage floor. The video, audio and intercommunication cables also plug in to their discriminating type of receptacles located at the pin rails.

A studio audience sees both the stage action and a 15x20-ft screen on which the picture that is going on the air is projected by the largest color and black and white projectors in existence. These powerful "barrel" projectors require an 80,000-v transformer, which is isolated in a vault under the stage. Sound for the audience comes from overhead mounted speakers. Other speakers over the stage are used for actor cuing, prerecorded music or sound effects, etc.

Still growing, an additional color stage and another technical building are under constuction, requiring a 34-kv substation. Future plans are to convert one black and white studio to color and add a three-story office building.





Counterweighted battens, 17 of them for border lights and an equal number for pipe-mounted spots and floods with a plug and cord for each, make a forest of lighting equipment above the scenes on the stage. Upper picture shows these being installed. Center shows the receptacles stations for power, portable lighting and for video and sound along the side pin rails. Below shows installation of 80-kv transformer and buses required by the projector TV "barrel" that puts 15x20-ft picture on audience's screen

Window lighting units mounted on trolley duct; corrugated facade section floodlighted by PAR floodlamps mounted on top of marquee

Style Center Sets Electric Mode Too

Lighting, blended for accent on architecture and highlight of merchandise . . . Liberal use of electricity in appliances and building services . . . Such were the visible results upon completion of Makoff's new style center in Salt Lake City. It is located on South Temple at Second East.

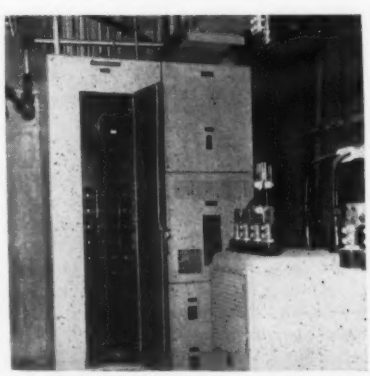
The remodeled building is L-shaped, 176 ft in both principal dimensions, and has 53,000 sq ft of merchandising space distributed on three floors. Fundamentally a shop for ladies, auxiliary departments include a beauty parlor, a tearoom able to accommodate 120 patrons and fur storage vaults. Appointments and arrangement were designed to add an atmosphere of luxury and to focus attention.

Electrical Engineer L. B. Gowan designed the electrical system to conform to the architectural plans of Ashton, Evans & Brazier. Energy is taken from Utah Power & Light Co.'s 4-kv underground system. The compact substation contains three 167-kva transformers connected 120/208 v wye, to supply all building needs. Transformers are connected to the main 1,600-amp secondary breaker through ventilated bus duct. Provision is made for 22 feeders, ranging from 30 amp to 400 amp. The submeters on the kitchen and beauty parlor feeders are rated at 400 amp and 200 amp respectively. The maximum 15-minute total demand to date was 239 kw.

The front is striking by the absence of glass, except for the show windows which extend across only the middle third. Recessed down lights under the canopy aid in drawing attention to the show windows. Spot lights above the canopy are directed upward against a corrugated wall, adding to the impression of height. The electric sign is back lighted with green tubing, and is mounted on an otherwise blank wall. The largest letter is 15 ft high.

The lighting of the show windows themselves is hung from three rows of trolley duct running the length of each window, and high enough to be out of the range of casual window shoppers' vision. This plan permits highly flexible arrangements of general and accent lighting on the displays.

The interior lighting is a judicious blend of fluorescent and incandescent lighting. In the selling areas, the greater part is incandescent, divided between recessed 10-in. square units and recessed eyeball units. A few strips or squares of glass-covered fluorescent units are recessed over counters. Office lighting is continuous rows of fluorescent units. Some bullet-type fixtures are hung on the columns and from the ceiling over part of the display cases.



Transformers, switchboard and bus duct . . . Restaurant kitchen equipment is all-electric

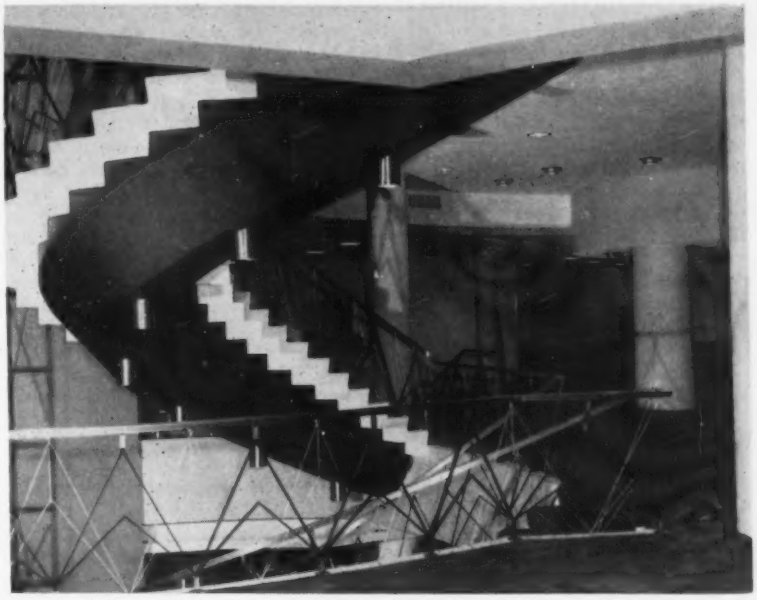
Additional general illumination is furnished by some 2,200 ft of sign lighting tubes placed in double rows in coves. The eyeball and bullet fixtures allow accent to be shifted as desired. Fluorescent fixtures in the tea room are indirect and fitted with dimmer ballasts.

The electrical contractor, A. N. Sisam of Salt Lake City, worked closely with the architect and the other crafts to make fixture installations conform to the architectural motif. In an area dominated by a circular cove or a circular wall, recessed fixtures were set in arcs or circles having the same center. Where the coves had scalloped edges, fixtures were set on a bisecting line as well as the arc just mentioned. The top flight of the spiral staircase is lighted by fixtures directly over the spiral centerline, all with different stem lengths to maintain a constant mounting height above the treads. The lower flight is illuminated by recessed fixtures, with external sleeves, cast in concrete along the centerline of the upper flight. In the areas with acoustic-tile ceilings, the ceiling contractor gave a starting mark near a corner. The fixtures then were recessed so as to bridge the seams, as equally as possible, in the tile.

About 4,000 ft of channel were used to support the 159 recessed fixtures. Usually, the fixtures were 10 in. deep, with only about 12 in. working space available above the finished ceiling—all cut up with ribs and beams from the original ceilings poured on pan-type forms. In places, anchors had to be set in slabs only 3 in. thick. Branch circuit cabinets were placed in back halls or other places so as not to interfere with the main decorating scheme.

Convenient self-service passenger and freight elevators have been installed. Three air conditioning units are complete with blowers, electrostatic precipitators, washers, precoolers and heating units. Discharge is from ducts above the false ceilings.

The all-electric kitchen is equipped with three-phase ranges and ovens, a 12-kw, three-phase deep fat fryer, and single-phase electric steam tables, dough-raising warmers, and 5¼-kw warmers adjacent to the ranges. The dishwasher is served from a 35-kw, three-phase, electric booster water heater. Single-phase compressors cool the refrigerators and walk-in boxes. The canopy over the ranges is lighted from underneath by vaportight fixtures.



Recessed lens units in the sidewalk marquee make the entryway attractive. Pierced brass cylinders shield PAR lamps flooding the stairs. Interiors of the store employ a variety of eyeball spots, recessed lensed units, coves and ornamental lighting fixtures

Impedance — Our Tricky Adversary

More about Grounding, Center of Confusion — 7

Tom Hughes
Electrical Engineer, California Division of Industrial Safety

Fulfilling of all the requirements and maintaining everything at unipotential is a difficult task, even from a theoretical standpoint. Immediately we get into a discussion of impedance and the proper choice of paths. As an example of the devious paths let's take an extreme case in which a man was electrocuted.

This happened in an old factory, fed with 240 v from a delta-connected secondary with one leg grounded. As shown in Fig. 1, a set of feeders was run open on insulators in the roof trusses from the service at one corner of the plant to a secondary distribution center at another corner. A few years later, an air line was run around the plant to different work centers and some of the electrical equipment was bonded to the air line by the perforated strap and stove-bolt method (an unacceptable means).

After the war, a three-phase machine on wheels was purchased and connected by a four-wire cord, as shown at location D. Its branch circuit was tapped off the same feeders and its conduit riser bonded to the air line as indicated at C. The motor at A developed an insulation fault to its case. This fed through its conduit around to the air compressor at B; through the airline to C; through the ground wire in cord D to the metal frame and handles of the machine. As the man wheeled the machine across a wet floor it went to ground through him at E and back to the transformer.

The original strap bond at F was buried with paint and dirt so that it was worthless as a bond. Instead of passing back to the service equipment ground, the fault current passed through the very ground wire that was intended to protect the man. We call this a feedback.

In Fig. 2, we have diagrammed another type of accident in which a man was electrocuted. This happened on a construction job where one driven rod at B was used to ground the service and distribution raceways and the neutral conductor of the supply. Fault current from the motor at A fed through the raceways and the grounding wire in the cord C to the electric vibrator at D. The man was holding the vibrator and standing in the freshly poured concrete of a deep column footing. He made a path to ground for fault current return to the neutral ground at the transformer.

Here is a case where the grounded neutral theory didn't suffice. Supposedly, the fault current should have returned to the transformer through the neutral conductor but enough of it (only a few milliamperes necessary) passed through the man to kill him.

The worst case of misplaced impedance we know of was at a dairy. The service equipment is on a pole some distance away from the dairy. Also at some distance away from the dairy is a well pump that supplies the dairy. From the service pole, wires are fed overhead to the dairy and to the well pump. This is 240-v, three-phase, four-wire service from a delta bank with the midtap of one transformer grounded and the neutral brought in for lights.

In spite of the fact that the well pump is mounted on top of the well casing, a fault occurred and current fed up the water pipe to the dairy barn, into the metal milking stanchions and killed seven cows. After that, considerable rewiring was done to correct code violations and the equipment was grounded, both at the dairy and service pole, by means acceptable to the code. However, we were told that two more cows were killed at a later date.

An extreme case of side path current was noted, a year ago, when a team of horses was driven into a barnyard after a heavy rain. The place was still being served from a temporary power pole, 40 ft from the barn. Grounding was done by a driven rod at the pole and another one for equipment at the barn. Fault current (later measured at 6 amp) from the barn was flowing through the soggy ground between the rods.

As the team was driven diagonally across this path, one horse was killed and the other froze in his tracks. They dragged him out of there and he recovered. This is told to show that, in spite of the fact that a good return path apparently existed, enough stray current can be received through body to kill. However, animals are often killed under conditions that do not injure humans.

The problem of impedance and stray paths is so acute, where high voltage is fed through portable cables to large power shovels in open pit mines and quarries, that extreme measures must be taken to assure the preservation of life. Not only can a man be electrocuted by fault current passing through him from the shovel to ground but

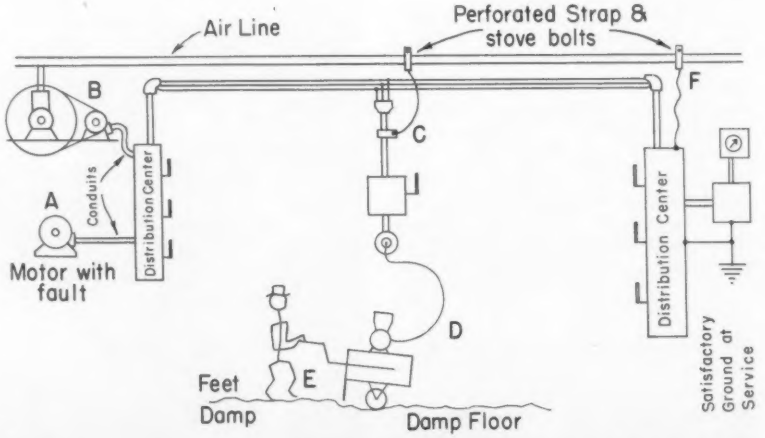


Fig. 1—A case where the grounding wire in the cord fed back and killed the man

there have been cases of persons being killed from stray currents in the ground at some distance from shovels. The conduction between rock strata is so unreliable that varying potential differences may exist across cleavages in the rock, etc.

The safest system for high voltage is to carry an adequate fault return conductor on the overhead pole line to the connectors for the portable cable. This conductor may be mounted above the other three to act as a lightning ground wire, also. The portable cable from the shovel is fed from the overhead line through a circuit breaker mounted in a can on movable skids or wheels. The grounding conductor in the cable from the shovel is brought through a sensitive relay in the same can. At any time that a small current flows through it, this relay trips the circuit breaker and de-energizes the cable.

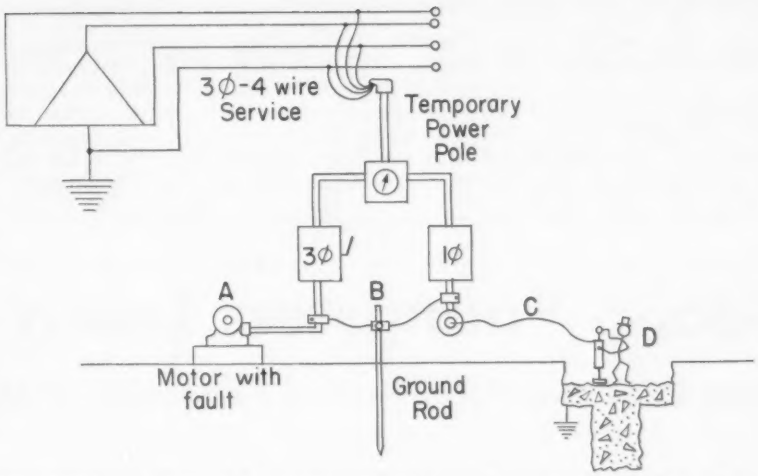


Fig. 2—Where the grounded neutral theory failed because enough went through the man

Higher Voltages Predicted

Higher voltage, now used industrially for interior wiring distribution, is beginning to find its way in commercial and eventually the residential field, Walter S. Gordon, consulting electrical engineer of Tacoma, told the Puget Sound Chapter of International Association of Electrical Inspectors at its second quarterly meeting in Tacoma, June 8.

Gordon discussed the relative merits of utilization voltages in the range 240/416 to 277/480 for commercial and industrial applications. He said that the industry is beginning to recognize the merit of higher voltages and is applying them more and more to even residential applications. That 120 v is becoming decreasingly important in commercial buildings was his opinion because of the increased use of higher voltage fluorescent lighting. It may amount to only 10 to 20% of the total load, he said.

Asked how to determine the extent of 120-v load to calculate for a new building, Gordon said this was difficult to do because one never knew what would be introduced later. Dry-type transformers are provided for this type of service with space for accommodating larger sizes later. He told of a loft building in Tacoma, however, that was converted to office space and now sprouts an air conditioner at every other window. In a generally cool climate this was something of a surprise. Savings of from $25,000 to $50,000 will be realized, he said, by using a higher voltage system for a building under construction at the present time in that city.

Total square footage of plastic washed, etc.	97,525 sq ft
Materials cost for cleaning	
Soap	$ 3.15
46 gal antistatic	145.82
Total labor and material	4,641.77
Cost per square foot (cleaning, washing, wiping baffles)	.047
Relamping	
Total quantity of lamps: 3,839 F96T12	
46 F72T12	
46 F48T12	
Total cost of lamps	7,918.96
Total cost of lamps and labor	8,673.12
Average labor cost per lamp	.192
First floor cleaning cost per sq ft	.043
Second floor cleaning cost per sq ft	.049

The additional cost for the second floor was because of the many partitions and telephone wires, etc. On the first floor, it is much more open.

Total cost, cleaning and relamping including material and labor $13,314.89

Cost of Cleaning, Relamping

Cost of cleaning a large luminous ceiling installation has always been a subject of discussion. From W. A. McGuire comes an interesting tabulation of the costs of a complete cleaning and relamping job in the engineering building of the El Segundo division of the Douglas Aircraft plant that two years ago attracted national attention because of the extent of its luminous ceiling installation. As the Wakefield Co. representative, McGuire had much to do with the installation design and has followed its performance closely.

The cleaning job consisted of cleaning and washing the plastic, wiping the dust from the baffles and a complete relamping. The job took 2,304 hours total and was started Dec. 12, 1955, and finished May 14, 1956. Original occupancy of the two floors was June 30, 1954, although the lamps had been turned on approximately one month prior to the opening of the areas. Approximately 17½ months had passed before cleaning was started, after the areas were occupied. The accompanying table gives the data.

Foot-candle readings, taken with the G-E cosine color corrected meter before cleaning and relamping, showed 82 f-c on the working plane. After cleaning and relamping, using the same light meter, the reading showed 124 f-c.

Another Electrical Week is being planned for even now. Although it will not be until next February, the industry will be better alerted and prepared for it next time and hence derive more benefit from it. This year it was organized too late to acquaint the industry with it and supply the publicity material in time for its use. A few activities were rushed into being at the last moment but these were all too few. Mostly these were intra-industry meetings in which the customary practice of talking to itself was the extent of the participation. Among others, efforts were at least initiated during February that may have budded and blossomed later but at least the job was done. One of the most noteworthy of these is reported below. Off to a late start, the electrical safety essay contest was carried through finally in April, but consider how much longer the benefit from this will continue with these young participants

Idaho Youngsters Learn Safety

From Snake River Valley Electrical Assn. Electric Week Contest

Having criticized the industry for lack of action during Electrical Week, the week of Thomas Alva Edison's birthday, the editors are happy to praise and congratulate the Snake River Valley Electrical Assn. at Boise for the fine safety essay contest it conducted among school children.

There were 700 entries received from the children of all southern Idaho schools in the contest among fourth, fifth and sixth graders. Both TV stations, KIDO and KBOI, donated about $2,000 worth of time, KIDO $1,500 and KBOI $500. KIDO is a member of the association.

Originally, the contest was sponsored by the association and the electrical inspectors. However, the inspectors were unable to participate. Idaho Power Co. judged the essays. The essays were to be written at home by the children on the subject of safety and proper wiring of the home and in the installation of all types of appliances. Circulars with the details of the contest and a safety check list were available at dealer stores, Idaho Power Co. offices, and were distributed to all Boise schools. Also given to each was a Kennecott booklet, "The ABC of Home Wiring."

The papers were turned in to the Idaho Power Co. offices in Boise and the entries were judged between March 1 and 17. The TV stations then plugged the contest on the "Merry Milkman" and "Sheriff Spud" daily programs. Prizes ranged from $10 to $1 and the 38 winners were presented $2 cash prizes on TV by "Sheriff Spud" and "Merry Milkman." Prizes were awarded in April and considerable publicity given to the occasion.

An earlier start on the program next year, according to C. J. Bradford, secretary-manager of SRVEA, who sparkplugged this contest.

The three $10 top prize awards are reproduced here. They give a good sales story on the need for proper wiring and safety in the home.

Electrical Safety in the Home

If we are to have electrical safety in the home, let us find what electrical safety means.

There are six letters in the word safety.

S, which stands for safe, means free from danger.

A is for appliances, which must be in good working order.

F means fuses of low amperes to prevent dangerous overloads.

E stands for extension cords, which should never be extended through doors or hung on nails.

T is for television sets. They should be well ventilated in back and kept away from curtains.

Y is for yard lights, so we won't stumble in the dark.

These are only a few electrical safety rules we should follow. I'm sure that if we follow them, then there would be less danger from electricity. —*Johnny Musgrove, Payette, Idaho, sixth grade.*

Monev—and House—to Burn

Silly Sam was so happy! He had just bought a home.

When he handed the key to Smart Sue she asked, "Did you inspect the electrical system before you bought it?"

"Of course not," laughed Silly Sam. "Didn't the man who built that house 30 years ago know how to wire a house?"

"But dear, times have changed," said Smart Sue. "Our electrical needs are much greater now than then." But Silly Sam wouldn't listen.

Silly Sam sticks pennies behind his fuses. If his lights dim, he blames the power company. If his appliances don't work well, he has unpleasant thoughts about the dealer who sold them to him.

Silly, Silly Sam! He doesn't know his house is poorly wired. Besides, he has money to burn!—*Lee Duncan, Nampa, Idaho, fifth grade.*

How to Have a Safe Home

When I grow up and have a home of my own, I am going to remember all the things I have learned from writing this story.

First of all my house is going to have many outlets. Then I won't have to put so many plugs in each one to cause fuses to blow out and appliances not to work as well as they usually would. The outlets and switches will be put at each door.

Next, the wiring is going to be changed as I buy more appliances. Then more power will come in through the wires to make them work better and not cause motors to burn out. It will save me money because the heat won't be wasted and there won't be any short circuits or serious fires. I will want an electrician to wire my home. Then I know it will be all right.

I will never hang a cord over a nail to damage it, have cords under rugs to be stepped on, use frayed cords or touch appliances while in the bathtub.

If I can do these things I should have a safe home.—*Karol Lynn McDowell, Halfway, Ore., fourth grade.*

ELECTRICAL WEST SALES GUIDE © JULY 1956

News Letter

FOR THE ELECTRICAL MERCHANT OF THE WEST

Dealers beefs

Dealer complaints about price cutting, by-pass selling, shortened manufacturers' discounts showed up again this year in NARDA's Cost of Doing Business Survey. However, they were couched in stronger language, the associations reports. Other gripes were loose franchising, overproduction, fake advertising, sales training problems, the soft farm market. Richard Snyder, analyst who compiled the survey, stated that the obstacle list would be about the same in 1956 with these additions: shortage of good salesmen; increased wage costs; shortage of capital.

Record in '55

Dollar sales volume of reporting dealers rose 10.1% in 1955 over 1954 and inventories were turned 5.5 times, a new high. Total cost of goods sold reached a 10-year low in 1955, at 65.7% of net sales. The 1955 total gross margin ratio set a 10-year high at 34.3%. Gross margin on merchandise only was 31.6, second highest in 10 years. Total operating costs in 1955 were 30.9% of net sales, second only to the 10-year high of 31.4 in 1954. Net profit ratio rose to 3.4 from 2.6 in 1954. Washers, freezers and dryers strongly increased their shares of the total sales dollar during the year.

Outlook for '56

Dealers expect market conditions to remain chaotic in 1956, same as in 1955, but a majority foresee gains in both sales and profits. Average expected increase was 14%. The 86% majority of reporting dealers who stated opinions on best selling lines in 1956 mentioned laundry equipment most often. TV ranked second with refrigerators close behind; air conditioners were fourth and ranges fifth. Kitchen equipment, freezers, phonographic equipment tied for sixth place, followed by dishwashers.

Show time

Live Better Electrically was the theme of Boise Valley's second annual home show, which drew attendance of 23,000 during its four-evening, two-afternoon run, June 7-10. Sponsored and managed by the Snake River Valley Electrical Assn., the show featured display booths but provided plenty of entertainment for those who had made the rounds. Every night one major electric appliance and many smaller door prizes were given away. There was a total of more than $5,000 in these prizes.

Color TV sales up

Color TV sales, while still numerically small, greatly exceed those of a year ago, H. C. Bonfig, chairman of the Set Division of RETMA, stated recently. Outlook is even more promising for the fall and winter, he said, with indications pointing to an upturn during the second half. Generally speaking, the past year has been one of intense competition, low prices and slim margins for the TV set manufacturer although unit production and sales have remained high, he reported.

TV set tester

Testing of TV receivers is said to be aided with a new Sylvania picture tube designed for that purpose. It is an 8½-in. tube with automatic focusing and a parallel-mounted electron gun. Said to be suitable for testing any receiver or picture tube from 10 to 27 in. A carrying case with handle is included.

Service

A year's service for $12.95 will be given by Admiral on its new 10-in. portable TV receivers. Parts, tubes and labor are covered when the set is sent to an Admiral distributor's service department.

Lower tax asked

NARDA has joined RETMA in an effort to get the excise tax on radios and television sets reduced to 5%. Reduction of the present 10% tax would help curtail prices, assist the industry in competing for sales.

Color is accelerating obsolescence in refrigerators, it would seem from a survey by Hotpoint of 256 owners of colored refrigerators, its own and competitive makes, in 18 major cities. The manufacturer reported that 79% of these owners stated their refrigerators were not worn out prior to purchase of the new unit; 28% said the old unit was less than five years old, 37% less than 10 years old. Answering the question, "What did you do with your old refrigerator?" 39% answered "sold it," 38% "kept it," 16% "traded it in," 7% "junked it." Seventy-two per cent had purchased the colored refrigerator at an appliance store, 8% from a contractor, 4% from a furniture store, 4% from a department store, 2% from a hardware store and 6% said it came with the house. Yellow led in choice of color, followed by pink.

Color here to stay

Charging attempts to maintain resale prices through a system of advertising allowances, the Canadian government will launch a prosecution against Moffats Ltd. of Weston. Three unnamed dealers also will be included in the action. To be heard in September the case grew out of a report of the Restrictive Trade Practices Commission. The report charged that the manufacturer was violating new provisions of the Combines Investigation Act prohibiting resale price maintenance. This is the first time that a company has been accused of attempting to induce dealers to sell their products at company-established prices through advertising allowances. The manufacturer makes both electric and gas ranges, air conditioners, refrigerators and washers.

Precedent setting case

To push appliance sales in its rural service areas, Sacramento Municipal Utility District is conducting a series of cooking schools and recipe contests. A fall series will follow the spring schools. Rural residents are asked to submit favorite recipes for casseroles, cookies and cakes. Winning recipes are announced at the school. They are also prepared there and given as door prizes.

Proof of pudding

SMUD too has introduced a time-payment plan for modernization of home wiring and appliance purchases. This promotion shared the spot in its June advertising with heat pumps and electric water heaters.

Time plan

In San Diego the Bureau of Home Appliances reports considerable success with its Home Freezer Promotion that runs through August. Built around the slogan "Friend of the Family," the campaign is a cooperative program with grocers and food markets, who are offering freezer specials during the period. A 32-page booklet, Food Freezing Facts, had been made available to dealers by San Diego G&E.

Freezer is friend

San Diegans will be getting out their Christmas tree lamps five months early this year. As part of the spectacular Fiesta Del Pacifico, which will be staged there July 18 to Aug. 19, residents are being urged to string the Yule lights outside —over doorways, on shrubs or elsewhere. A certain date will be set for this display, probably opening night.

December in July

Revised domestic rates for Washington Water Power apply in private residences and individual family apartments where electricity is the only means of water heating and where all service used is supplied through a single meter. The basic change is that the 500-kwh block at 7/10c per kwh has been assigned specifically to customers using electric water heaters. Industry allies were reminded in a letter from Kimball Jack that the average customer will use approximately 300 kwh per month for water heating, leaving some 200 kwh available for other uses at $1.40 instead of $2.40.

A better bargain

Answering a questionnaire sent out by PP&L's Wes Dunn, sales managers of NELPA companies gave their views on what management expects of the home service department. What they expect in general is an effective sales job. As for specific questions: "Do you believe that making individual home calls is an effective and economical way for utility home economists to operate under present conditions?" brought a 90% no answer. Response to "Do you believe that mass demonstration is more effective and economical than individual home calls?" was 100% yes. Sales managers believe that home economists should be good cooks (90% said yes) but are unanimously against their concerning themselves with teaching women how to cook. As to whether home economists are generally a misunderstood group of specialists, who are not allowed to put into effect well thought-out programs, sales managers believe not, through one replied "I don't but our home economics staff does."

Sales are the object

"If it's new . . ."

Contending that "if it's new, it's electric," Washington Water Power has been demonstrating the electronic range throughout its system. And this program wasn't only for the adults. Schools were covered too. When Spokane held its home show recently 2,500 students were brought in from 41 high schools and 30 communities; were shown the atomic reactor, a new method of generating electricity, and across the aisle, the newest in electronic cooking. Much of this information was passed along to the parents, who turned up at community demonstrations. Said one mother to Dorothy Smith, WWP home economist: "My son told me you cooked on paper. I had to come and see it!"

Will it be UHF?

FCC will receive comments until Oct. 1 on its proposed gradual shift of TV broadcasting from VHF to UHF. The shift would provide 70 channels as compared with 12 VHF. The commission rejected industry proposals for deintermixture on a national basis but said it would consider it for certain areas. Legislation to force the changeover might take the form of special tax relief to equate all-channel receiver costs with those of VHF only or a ban on shipment of any but UHF-equipped sets, it was suggested.

Orders slow

Poor attendance and light buying were reported from the Chicago Market in June. Inventories were high because of stepped-up production that followed heavy January orders. The April slump also contributed to cautious buying. A possible rise in steel prices and tight credit were problems facing the industry. Many, however, still hope to top 1955's sales record.

Revised

The revised 1956 edition of Electrical Living, an appliance catalog, has been published by Nelda Publications, 425 Fourth Ave., New York 16. It contains lines of more than 300 manufacturers; contains 100 pages.

New posts

Harry P. Gough has moved over to G-E Electric Appliance Co., the organization set up to distribute G-E major appliances and television. He will head operations at its northern California headquarters now under construction on a nine-acre site in Burlingame. To take his place as regional manager for the company's Appliance and TV Receiver Division, Howard A. Oliphant returns to the West. Oliphant, who will be located in San Mateo, was formerly West Coast specialist for the Range and Water Heater Department, headquartered in San Francisco; was called to the home office in 1951 as national sales manager in that department.

News of distributors

Southern California branch of G-E Appliances Co., which took over distribution and sales of G-E television from G-E Supply on July 2, was host at a special preview of the 21-model 1957 line. TV dealers throughout southern California attended the showing at the company's warehouse, 2957 E. 46th St., Vernon, S. B. Maher, branch manager, reported . . . **Fred D. Benz Co.**, 444 Brannan St., San Francisco, has been made sales rep for Tork time switches in northern California. Fritz Benz, who now manages the firm, has as his associate Ed J. Riley . . . **Hoffman Radio Division** has given a distributorship to Western Supply Co., Saft Lake City.

New quarters

Construction has started at Los Angeles on a service center and sales office for G-E's Housewares and Radio Receiver Division. The 22,500-sq-ft building at Beverly Blvd. and Lafayette Park Place will be completed about Oct. 1. It will give more space and improved facilities for service center and offices, which are now in widely separated locations. Off-street parking will be provided.

New setup

Distributorship of RCA-Whirlpool laundry equipment has been transferred from Graybar to RCA Victor Distributing Corp. in Los Angeles and to Jerry Achtenhagen & Sons in San Diego. Erwin Fisher has been added to the Achtenhagen sales force in the major appliance division, which is managed by Bill Durning. H. C. Chapman, vice-president, is in charge of the RCA Victor Distributing Corp. at Los Angeles. Both firms will continue to handle RCA-Whirlpool freezers, air conditioners and ranges.

Shifts

In San Diego Art Tamborini has moved to G-E Appliances Co. with transfer of the G-E television line from G-E Supply, which is taking on the Hotpoint line and will add D. W. Osier as inside sales representative . . . Lee Bornstein is moving his appliance warehouse operation to 373 Third Ave., San Diego . . . Merchandising Distributors Inc., 1002 W. Juniper, San Diego, has taken over the Norge distributorship formerly handled by Nystrom Bros. E. E. Furstenfeld, who has been sales manager for Nystrom, is president of Merchandising Distributors, Donald F. Osgood is vice-president.

Mourned

Regretfully we report the death of John H. Adams, residential sales representative in Southern California Edison's commercial department. A member of the organization since 1927, Mr. Adams was formerly assistant merchandising manager under Henry Rice.

New managers

As a part of its drive to increase sales volume, Westinghouse has added new district managers in the portable appliance field staff. They are Gordon E. Thompson, who will handle vacuum cleaners and fans in the Los Angeles area, and Robert G. Marshall, Long Beach portable appliance manager.

Appointed

Robert S. Sloan was named Western division manager by Norge in realignment of its field sales force into four geographical divisions. Headquarters are at San Francisco.

More about people

Eugene R. Whittle, newly appointed assistant Western regional sales manager for Amana, will work with distributors and dealers, primarily in the Salt Lake City, Boise and Denver areas . . . Thomas B. Kalbfus, one-time southern California district sales promotion manager for Wesco, has been made general sales manager of the Westinghouse TV-Radio Division . . . **William H. Cormier** has been named general sales manager for CBS-Columbia of Southern California, distributing branch for CBS TV and radios . . . **O'Farrell Welch,** with Leo J. Meyberg Co. for 16 years, is now general manager of the Hoffman Sales Division of San Francisco. He succeeds **John Chadwell,** who had been serving on an interim basis . . . **K. Warren Snider,** with Motorola since 1946 as regional sales manager in California and in Seattle, has been made radio-phonograph product manager of the company . . . **Jerry Martin,** for eight years with Air-Wave Radio & Television Co., Magnavox service agency in Salt Lake, will now handle Magnavox field service in that area . . . **Edmund B. Barnes,** recently appointed general sales manager for Kelvinator household appliances, was in the West from 1939 to 1955, first in Los Angeles and later as Pacific Coast regional manager . . . **Robert L. Covell** took over the Packard-Bell distributorship in San Diego on June 1 . . . **Ray F. Kranz** has moved from Chicago to Phoenix as factory representative for McGraw Electric. He has been with Westinghouse, G-E and Magic Chef.

New representatives

In a realignment of sales management responsibilities for General Electric-Telechron clocks, John T. Casey has been made Los Angeles regional manager, with responsibility for eleven Western states and the southwest. Allen W. Rork, Chicago, will work through Montana. These men will take over the work formerly assigned to Donald E. Berry, clock sales manager, who was made vacuum cleaner sales manager.

Fast cooking

Deliveries were to be made in July on Kelvinator's electronic range, which will be priced at $1195, including installation and a year's warranty. It comes as a stack-on unit in polished chrome shell or as a built-in. It has a browning element; a hi-low selector to alternate speed. Range uses 220 v; magnetron operates on 2,450-mc frequency. Connected load is 7.7 kw.

TV line

Hotpoint's new Hi-Vi television line, which was to make its debut at the summer market, will include a complete line of portable, table and console models ranging from a 9-in. portable to a 24-in. console. Suggested retail prices begin at $99.95. In addition to the 9-in. portable, 14-in. and 17-in. models will be offered in five combinations of two-tone colors. De luxe 21-in. table models have such features as stay-set volume control; two-way power tuning that automatically rotates the tuner to an active station at press of a button; "lighthouse" channel spotter to show channel number across the room; remote control at optional extra cost. All models come with UHF at slightly higher cost.

Built-in

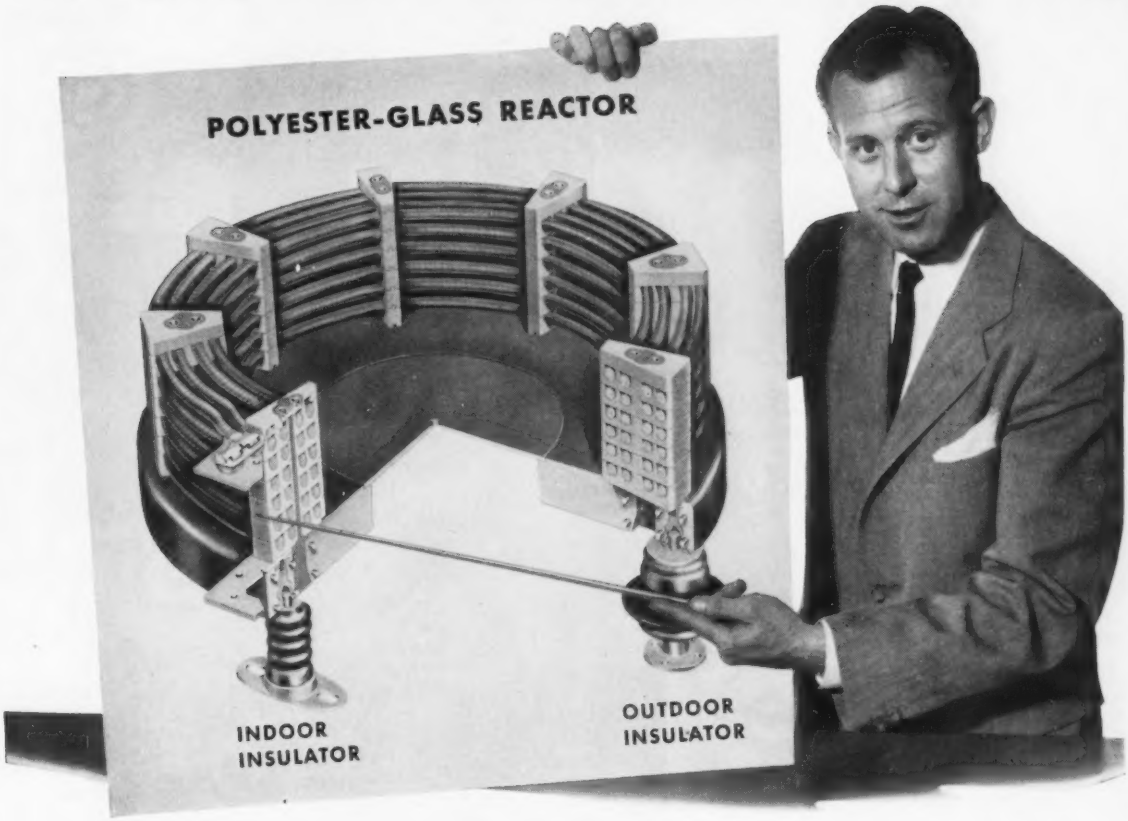
A built-in double oven has been unveiled by Norris-Thermador Corp.'s subsidiary, A. J. Lindemann & Hoverson Co. Features are: triple rotisserie; double-oven convenience at eye level.

For bread

Norge Division of Borg-Warner has built a bread box into its new upright home freezer. The compartment is enclosed in the bottom portion of the freezer door. It opens with a "fold-out" action.

Heaters

Nine portable models, seven with automatic controls, are included in the 1956-57 room heater line being introduced by Arvin Industries Inc. . . . A small portable heater has been introduced by Electromode in two-tone driftwood or desert sand. Comes in manual and automatic models; 1,320 and 1,650 w.



"Ageless" materials make new reactor stronger, lighter, more durable

The news in the new line of Westinghouse current-limiting reactors is a polyester glass that is stronger and lighter by far than any material used before in reactor construction. This polyester not only solves the aging and maintenance problem, but also permits a 30% reduction in reactor size and weight.

This new material provides these outstanding characteristics: (1) Exceptional mechanical and electrical strength—3 times the compressive strength and 10 times the tensile strength of concrete. (2) Great resilience to thermal and mechanical shocks—will withstand the forces generated by heavy short circuits and expansion of conductors during overloads. (3) Unequaled durability—polyester is impervious to moisture and all atmospheric conditions. Unlike concrete, it will not age or deteriorate under normal operating conditions.

The cleats are solidly bonded together by a special high-strength reinforced resin. This results in greater column strength and greater resistance to short circuit stresses between units—permits closer spacing between reactors, without the use of braces.

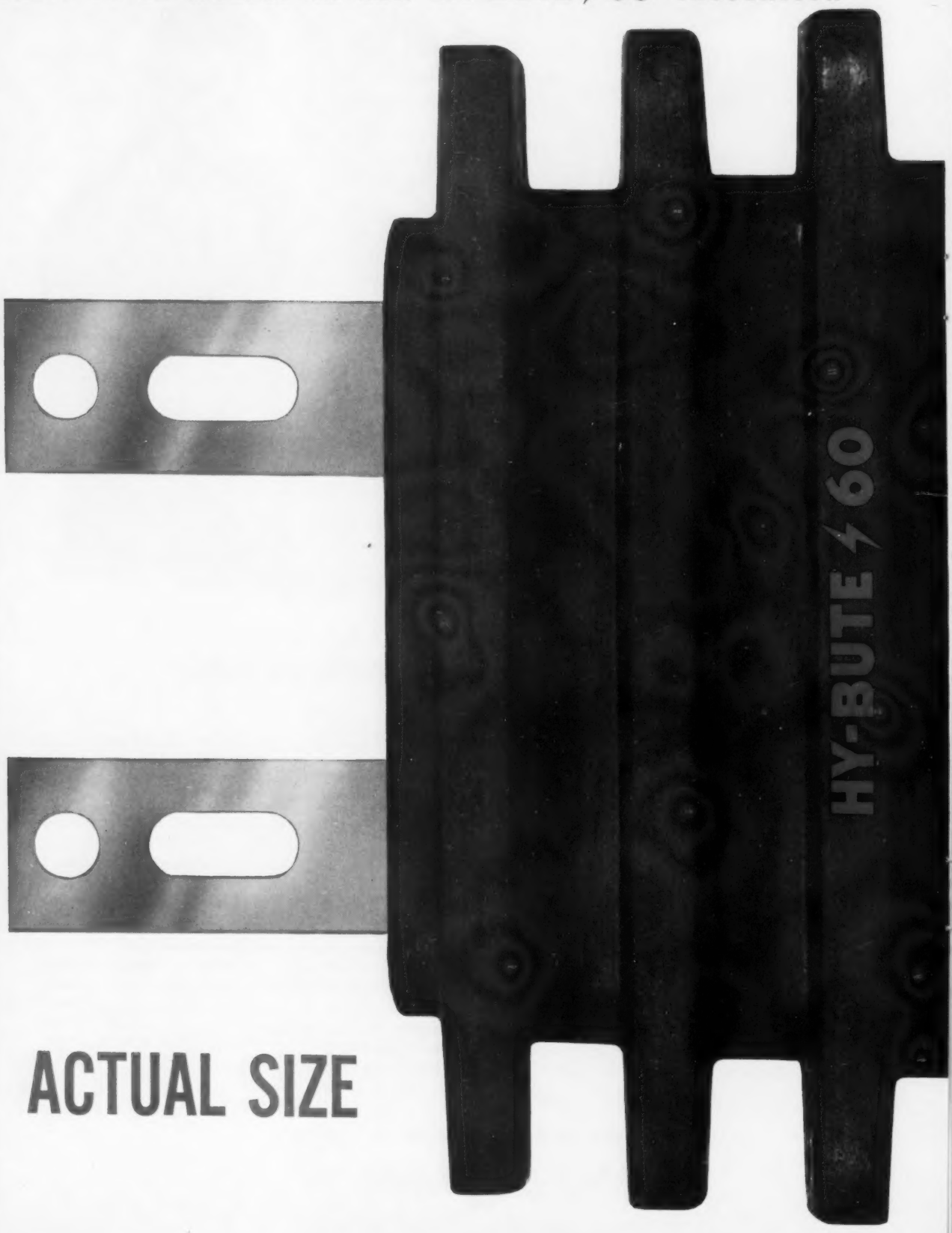
These new, smaller Westinghouse dry-type reactors are available in all ratings for indoor and outdoor service. For more complete information, call your nearby Westinghouse sales engineer, or write direct to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70753

YOU CAN BE SURE...IF IT'S

Westinghouse

Plants at Berkeley, Calif.; Sunnyvale, Calif.; Emeryville, Calif.; Los Angeles; Portland; Salt Lake City; Seattle; Denver

FIRST TO BE MOLDED IN NEW **HY-BUTE ⚡60* *INSULATION***



ACTUAL SIZE

G.E.'s New 15-kv Instrument Transformer Mounts Easily; Needs Less Maintenance

LIGHT AND MORE RUGGED, TYPE JKW-5 MOUNTS IN ANY POSITION

General Electric's discovery of an internal oxidation mechanism which can be added to ordinary butyl to prevent arc-tracking now makes feasible the molded construction of outdoor current transformers in the higher voltage ranges. This new compound, Hy-Bute/60 insulation, gives you seven big advantages in the new type JKW-5 15-kv instrument transformer.

NEW JKW-5 REPLACES 3 TRANSFORMERS because it can be mounted in any position. It supersedes the bottom, top and side-connected designs. This simplifies stocking and maintenance problems.

CORROSION-RESISTANT materials—new Hy-Bute/60 insulation, stainless steel and copper—virtually eliminate necessity for maintenance.

WEIGHS 20% LESS than older type, top connected transformer of the same rating.

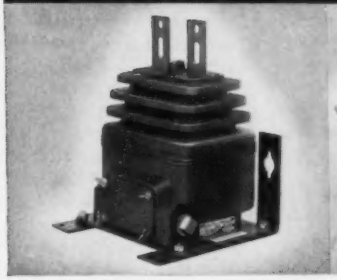
SMALLER SIZE coupled with lighter weight makes the General Electric JKW-5 easier to install. The new transformer, shown here in actual size, measures only 15¾ inches high, 10⅞ inches wide and 9½ inches long.

NO PORCELAIN BUSHINGS to crack because new Hy-Bute/60 serves as bushing, insulation and case on the new JKW-5. This feature removes possibility of failure which might occur as a result of thermal shock or external damage to porcelain bushings.

SAFER OPERATING, General Electric's Hy-Bute/60 insulated transformers cannot explode or catch on fire like older types.

LONGER LIFE is assured because Hy-Bute/60 insulation is mechanically tough, chemically inert, heat resistant, impervious to severe weather conditions and has high dielectric strength.

YOU GET SIMILAR BENEFITS IN OTHER MEMBERS OF G.E.'S BUTYL FAMILY



JKW-3 5-kv current transformer is available for outdoor applications

JKM-5 15-kv current transformer for indoor applications

JCP-0 600-volt current transformer for high-current indoor/outdoor applications

For more information about the new JKW-5, contact your nearest G-E Apparatus Sales Office or write for Bulletin GED-2727 to Section 581-2, General Electric Company, Schenectady 5, New York. For information about General Electric's complete line of instrument transformers, request Bulletin GEC-1028. 581-2

*Trade-mark of General Electric Co.

GENERAL ELECTRIC

Bill Wise, O'Brien's TV & Appliances, shows one of the prizes to Mrs. Barbara McCormick, a weekly winner. At right Neil Riegelman of Harold Kelley's Appliances selects suit he won by validating a winning entry in PGE's Wifesaver Electric Range Contest

Utilities Promote Electric Living

That utilities are taking their full share in the industry effort to promote electrical living is evidenced throughout the West. Promotions, dealer incentive plans, financing programs are reported from all sections. On these pages are a few of the details. What other utilities are doing will be reported in future issues.

Operation Trade-In

A contest designed to earn customer and dealer support was a feature of the double-barreled Operation Trade-In promotion conducted by Portland General Electric Co. in April and May.

As reported by W. L. Tait, PGE appliance sales promotion manager, the eight-week program had two phases: (1) a cooperative plan that gave dealers trade-in allowances up to a $35 maximum; (2) a consumer contest which offered 24 electric ranges and an electric kitchen as grand prize for the best 25-word essays completing the sentence "Eight out of ten of my neighbors use and prefer an electric range because . . ."

The dealer received a $15 trade-in allowance from the company for any type of range. He in turn gave the allowance to the customer as a bonus trade-in on purchase of a new electric range. An additional $10 was given to the dealer if the range-buying customer converted from schedule 8 to PGE's all-electric rate, schedule 9. If the trade-in range was delivered by the dealer to the company's Portland Service Center another $10 was allowed.

The Wifesaver Electric Range Contest was aimed at PGE customers but carried dealer incentives. Each essay, accompanied by an official entry blank, was submitted to an appliance dealer selling the make of range the contestant indicated he or she would like to win. Three ranges each week for eight weeks were given as prizes. Weekly winners were eligible for the grand prize, a $3,000 all-electric kitchen. Salesmen who validated the winning entries received ready-made suits from Cromwell Tailors. A $289 shopsmith went to the salesman whose name was on the grand prize essay.

In setting up the contest, an attempt was made to put as much dealer value into it as possible. In addition to required dealer validation, salesman incentive and trade-in bonuses, prizes were displayed on dealer floors, not in company windows. Result was enthusiastic dealer response, Tait said. Some dealers even picked up entry blanks for mailing to their own prospect lists.

While final results were not tabulated when this was written, some 7,000 selected entries were worked over in the Portland service area and range sales for the two months were expected to run above 1,000 units.

HERE ARE THREE WINNERS

Winner from Roberts Bros., Portland

"Eight out of ten of my neighbors use and prefer an electric range because: simpler, safer, speedier, an electric range looks better, cooks better, bakes better—it unties Mom's apron strings faster and spares Pop's purse strings too."

Winner from Meier & Frank Co., Portland

"Eight out of ten of my neighbors use and prefer an electric range because they're LAZY—enjoy cleaner walls, pans, quicker cooking; they're SCARED—of flames, fumes; they're 'SCOTCH'—relish **lighter** bills; they're horticulturists—we exchange **thriving** kitchen plants."

Winner from George H. Morlan Co., Portland

"Eight out of ten of my neighbors use and prefer an electric range because the 'electrifying difference' is S-E-R-V-I-C-E—**felt** in cool, clean, quick cooking, **seen** in lower cost, **sensed** in absolute safety, effortless ease and MATCHLESS convenience."

Busting Bottlenecks

As a positive program to build electric load Pacific Power & Light Co. is conducting a three-month BWB (Busting Wiring Bottlenecks) campaign around its wiring finance plan. While wiring finance plans are not new, this

one has some features not usually found. For instance, purchases of permanent lighting fixtures as well as electric water heaters are included.

The campaign, which was announced in an attractive and comprehensive brochure, "Getting Behind the 'Copper Curtain'," runs during May, June and July; covers residential and rural customers. Not organized as a permanent service, the plan's initial success may bring an extension.

Intensive advertising and sales promotion supporting the program included a series of dinner and evening meetings for allies—electric dealers, wiring contractors, plumbers, representatives of financing institutions, newspapers, radio and TV stations. PP&L employees in all service areas were alerted to details of the campaign at afternoon meetings preceding the dinner or evening meeting for allies.

A dual slogan, *Time to Retire* and *Live Better . . . Electrically,* was carried throughout the promotion.

Preceding the all-out campaign, a similar plan had been in operation since last December on an experimental basis in the company's Springfield district and on an informal basis in Portland.

Pacific's plan is limited to existing residential and rural customers who own homes that are already wired. Maximum is $350 for any one customer; a $15 minimum may be waived under special local conditions. No initial down payment is required and maximum contract period is 36 months. Interest rate is in keeping with ordinary FHA Title 1 rates.

Procedure is simple. An eligible customer applies to his contractor or dealer who in turn asks the local office of PP&L for authorization to proceed. After the installation is completed Pacific pays the contractor or dealer in full and bills the customer monthly with his service bill.

Wes Dunn generates enthusiasm at a kick-off meeting in PP&L's Wiring Finance campaign

Schools—1956 Style

Success of Puget Sound Power & Light Co.'s 1955 Cooking Schools brought a repeat this year, with more than 36 scheduled during the first four months. Co-sponsored by local newspapers, the shows feature brief demonstrations with plenty of menu material and information on new uses of appliances. Live Better . . . *Electrically* is woven into each program. These demonstrations, plus audience participation, guessing contests, prizes and sometimes music, bring capacity audiences.

The schools are truly a cooperative effort. The newspaper co-sponsor takes care of publicity. Puget Sound's home service director, Edith Rauch, and her six assistants put on the demonstration; others in the Puget sales force help with the program. Appliance dealers, distributors and food suppliers support the schools with advertising, display booths, prizes.

Capacity or overflow attendance is recorded for almost every show. A two-day *Bremerton Sun* school drew 2,605; the *Daily Olympian* program had an overflow, 1,800 spectators. For a special school sponsored by the *Auburn News,* a supermarket and one dealer, 10,000 prize tickets were given out.

Repairs Financed

Many customers need appliance repairs but cannot pay cash for them. Appliance repair agencies would like this business but, in most cases, cannot afford to accept time payments. To help both groups and retain load, Washington Water Power Co. has worked out an appliance repair finance plan. The program, which is being continued through Oct. 15, will enable WWP customers to finance on their electric service bills repair of all appliances except clocks, radio and TV sets.

Approved servicing agencies participating in the plan get a signed agreement from the customer that the work is satisfactory and assign the bill to the power company. No work is done before credit approval is secured.

Contracts cover residential appliance repairs between $15 and $100 and commercial appliance repairs between $15 and $500. Minimum payment in each case is $3 a month and maximum time is 36 months.

WWP has had a wiring finance plan in operation for more than a year; has had no losses so far. In May Gordon F. DeFoe, general sales supervisor, reported that 674 jobs had been financed for a total of $112,894.

Edith Rauch and Joan Ortman on stage at Bremerton Sun-Puget Power Cooking School, which drew 2,605 in two days. All schools in series have had capacity or overflow crowds

Diane Solberg, winner in WWP's scholarship contest, with Janet McNair of the home service staff at the grand final TV program, feature of a company activity that helped . . .

Train Future Homemakers

A program that performs a community service while it helps promote electrical living is the Reddy Kilowatt Home Economics Scholarship Contest sponsored by Washington Water Power.

As a result of this activity a student will receive a two-year scholarship to Washington State College, including normal tuition, registration and fees, not to exceed a total of $370.

Any high school senior who was enrolled in or had completed a credit course in home economics was eligible. Each contestant submitted a written entry giving her qualifications and outlining a five-minute cooking demonstration emphasizing any feature of the electric range. Each participant was told that she must be prepared to present her demonstration on TV during the grand finals.

The company divided its service area into five districts, allowing two representatives in Spokane and one each in other areas to compete in the finals. District winners were chosen after a personal interview with the top five applicants, selection being based on scholarship, need and ability. Top district winners received portable radios.

According to W. A. Lowry, residential sales supervisor, the presentations over TV were well done, despite the time limit. Company home economists helped on the TV program and with the job of informing school officials and students of the contest. Judges were home economists not associated with the company.

Commercials on the TV finals were carried by Dorothy Smith and Betty Lee Means, home economists in the general sales department, to fill in the time required for judging. These commercials told the story of the electric range, Miracle cable promoted by the company, the water heater conversion program and other WWP activities.

Rural Promotion

To carry promotional work into the rural areas of Colorado, the Colorado Farm Power Council has engaged two girls from Colorado A & M College to conduct freezer and range demonstrations in the towns served by the REAs, municipals and cooperatives in the area. Supported by distributors, the private and public power agencies, the council is very active. Don Hitchcock, Graybar Electric Co., is its chairman; W. L. Duncan, G-E Supply, its secretary-treasurer; and membership embraces seven groups in southern Colorado, three REAs and three municipalities, as well as the private power companies.

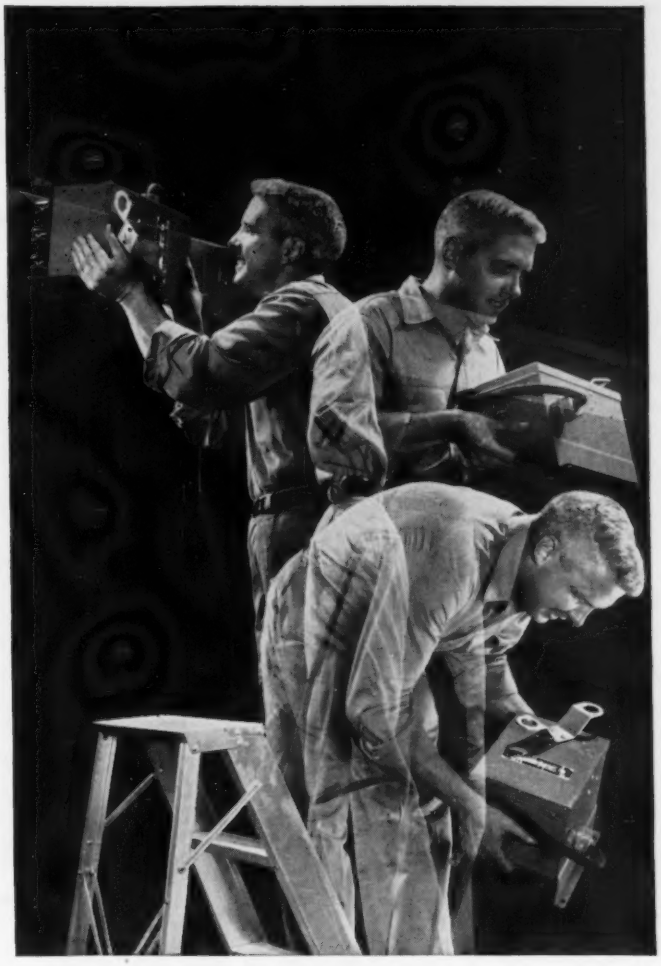
In a recent breakfast at the RMEL spring conference, a review of activities in the various parts of the state initiated by the council and its members showed considerable activity even under a very limited budget. Range and water heater promotions have been conducted in southern Colorado. Participation in county fairs and the state fair is anticipated by many of the members this summer and fall.

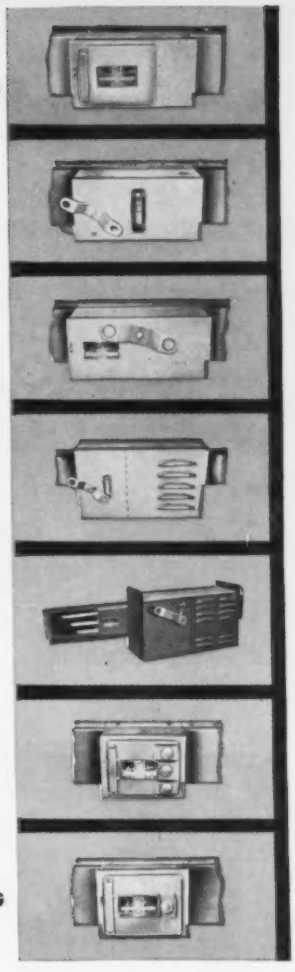
The demonstration idea resulted from a demonstration pool set up by Peggy Reynolds, home economist for the Mountain View Electric Cooperative. Two girls were hired from the college for the summer demonstration work and are being given a training program by Mary Lou Miller and Evelyn Lyons. Distributors were asked to help by showing them on Saturday mornings the equipment they handle. Although not professionals, it was felt that the girls will develop skill in demonstration work.

It was likewise suggested that distributors have field representatives operate at each demonstration by supplying equipment and aiding in every way possible. Fifteen weeks of demonstrations had already been signed up. If the program succeeds, it was felt that the council might engage a home economist for year-round activity.

A freezer promotion is contemplated for the period from Aug. 15 through September. Demonstrations on home wiring and electrical farm safety are also being conducted. A recent survey in the Yampa Valley, asking what appliances were wanted most, surprised the council by indicating that welders were first and water systems second among the farmers' preferences.

Leo V. Schroder, manager of Graybar's Seattle Builder Department, shows double-oven feature of Hotpoint's electronic range, which had its first Northwest showing recently. In addition to the microwave oven, this unit has a companion oven with Calrod units for broiling, baking and browning





7 ways to safer Plug-in Power / ...yours with BullDog Bus Plugs!

BullDog Bus Plugs for Plug-In Duct meet a full range of applications, perform with top efficiency and safety. Seven plugs are available—from types which tap power instantly from the duct to types which provide constant safety checks on its operation.

The seven BullDog Plugs—BP, Vacu-Break®, Circuit-Breaker, Capacitor, Transformer, Ground Detector, and Temperature Indicating—are all safety engineered.

Plugs mount on either side of the duct with ease, speed, and safety—and their compact design insures maximum use of all plug-in openings. In combination with Plug-In Duct, Bus Plugs provide a branch circuit distribution system of the greatest flexibility, convenience, and safety. It's a system which features *plug-in power*, to serve both immediate and future needs.

See how BullDog Plug-In Duct and Bus Plugs can serve you. See your qualified electrical contractor, distributor or BullDog field engineer—or write BullDog Electric Products Company, Detroit 32, Michigan.

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IF IT'S NEW...IF IT'S DIFFERENT...IF IT'S BETTER...IT'S **BULLDOG**

ELECTRIC PRODUCTS COMPANY

A Division of I-T-E Circuit Breaker Company

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Portland 12, Oregon

YOUNG ELECTRIC & MFG. CO.
2134 Curtis St.
Denver 2, Colorado

SAFETY SWITCHBOARD COMPANY
910—89th Avenue
Oakland 21, California

BULLDOG ELEC. PROD. CO. OF LOS ANGELES
2885 E. Washington Blvd.
Los Angeles 23, California

THIS MONTH'S NEWS

WWP Is Winner of G-E Coffin Award

"Extraordinary and enlightened leadership in a struggle for survival of free enterprise in the electric industry" has won for Washington Water Power Co. the Charles A. Coffin award.

This is the third time WWP has won the award since 1940.

Judges praised the company "for winning and holding, in the face of powerful opposition, the friendship and good will of its customers and other people of its area as dramatically illustrated by an overwhelming vote in favor of private ownership in Stevens County, Washington."

Ralph J. Cordiner, General Electric, and Harllee Branch, EEI, present award to Robinson

Banks

Water Authority Formed By State of California

Highest authority in water development problems in California is now the Department of Water Resources, a new agency that is headed up by Harvey O. Banks, former state engineer.

Abolished by formation of the department were the California Water Project Authority, the division of water resources in the State Department of Public Works and Banks' old office of state engineer. The State Water Resources Board, which was responsible for the California Water Plan, is under the new department operating on an advisory basis.

Banks, in his new position, is a member of the Governor's Council, so the new agency is in effect in a straight line of command starting with the governor. Both Banks and his deputy, Mercel J. Shelton, are appointed by the governor and can be removed by the governor.

FPC Extension Granted For Priest Rapids Job

Some of the pressure was taken off the Grant County PUD of Ephrata, Wash., in its proposed construction of Priest Rapids Dam on the Columbia River when it received a two-year extension in which to start work on the $163,000,000 project.

The FPC originally specified that work must be started by July 1, 1956. This date now has been extended to July 1, 1958, but the PUD hopes to start construction late this month, said William Schemp, secretary of the PUD commission.

Negotiations now are under way for sale of the bonds by an underwriting syndicate headed by John Nuveen & Co. of Chicago. Following sale of the bonds, a $91,878,625 contract for construction of the dam will be awarded to Merritt, Chapman & Scott of New York, which has established job headquarters at Ephrata.

Collapse of Penstock Causes Service Outage

Collapse of a penstock at British Columbia Power Commission's John Hart Dam caused an hour outage over the southern half of Vancouver Island, B. C., June 13.

The wooden penstock failure let water wash out foundations of a second penstock. Four of the plant's six 15,000-kw generators were temporarily out of service. Damage was estimated at $10,000.

Edison Gets PUC Permit For Big Steam Station

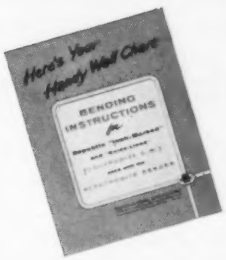
Southern California Edison has been granted permission from the California Public Utilities Commission to construct, at a cost of over $60,000,000, a steam-electric generating plant in Huntington Beach, Calif. The plant, to be located on a 60-acre site, will consist initially of two 200,000-kw units, but is expected to be increased ultimately to four.

Construction by Bechtel Corp. will begin early this summer, with the first unit scheduled for completion in June of 1958 and the second in December 1958.

YOU'LL STAY 'WAY AHEAD OF THE CONCRETE BOYS...when you're installing

SMOOTH BENDING AND EASY MEASURING are two reasons Republic ELECTRUNITE E.M.T. is so popular. The Guide Line, when properly used, eliminates costly "wows". Bends can be pre-planned, made accurately right on the job. Simply align the Guide Line with correct calibrations on the Republic Bender and you can't miss. "Inch-Marks" help you avoid clumsy problem of a flat rule on a round tube. Each inch and foot of tubing is clearly marked to permit easy measurement of exact length. On all popular sizes.

REPUBLIC "Inch-Marked" E.M.T.



IT'S "INCH-MARKED"
for easy measuring.

IT'S "GUIDE-LINED"
for accurate bending.

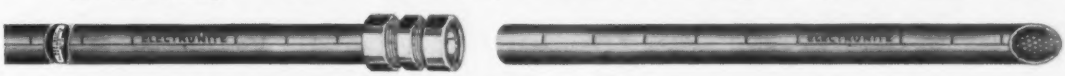
You don't have to worry about a pocket full of wet concrete when you work with Republic ELECTRUNITE® E.M.T. It goes in so smoothly you can't help staying ahead of schedule.

The reason: Republic E.M.T.'s *exclusive* features that simplify the job from planning to wire pulling.

Measuring distance is easier because the entire length of tubing is marked in inches and feet. Bends are easier to make accurately—and without costly "wows"—due to the handy, longitudinal Guide Line. Wire pulling is almost effortless because of the knurled "ball-bearing" inside surface of the tubing —another Republic exclusive.

Republic ELECTRUNITE E.M.T. makes it easier to meet schedules for any type of construction. For concrete-slab construction it's 100% approved by the National Electrical Code.

Keep the concrete boys off your back, and at the same time reduce costs by installing Republic E.M.T. Just ask your electrical distributor for the E.M.T. that's "Inch-Marked"® and "Guide-Lined." Check box in coupon to get free wall chart (left) that includes tips on using the Republic Calibrated Bender.



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Please send me more information on:
☐ ELECTRUNITE "Inch-Marked" E.M.T.
☐ Bending Instructions (Handy Wall Chart)

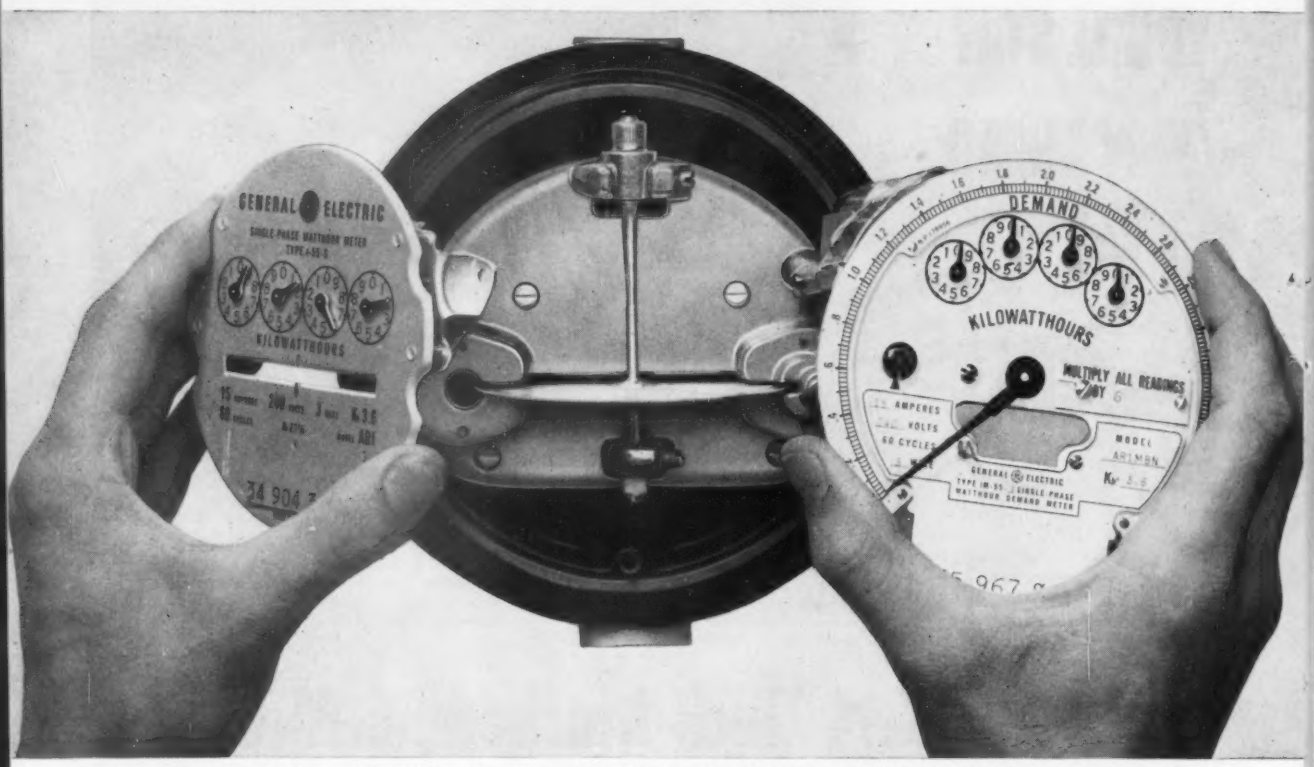
Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

DEMAND METERING



DEMAND REGISTERS OFFER MAXIMUM FLEXIBILITY, MAY BE INSTALLED ON ANY G-E SINGLE-PHASE OR POLYPHASE METER

Demand Registers: The Most Reliable Means to Low Cost Demand Metering

- Increasing number of utilities are taking advantage of the benefits offered by demand registers
- Flexibility of register assures reduced inventory and operating costs
- Greatly reduced testing and maintenance expenses have resulted from improved designs

The dependable low-cost operation of mechanical demand registers has led to their increasing acceptance by the utility industry.

General Electric engineers have released test results which give assurance of increased reliability of demand registers. These tests show that the life of the register rotor has been extended up to 10 years. This fact means that the register will need testing and maintenance only during periodic meter tests. This assurance of dependable performance offers the utilities unlimited savings in their demand metering operation.

DIRECT GEAR DRIVE . . . Not only is the register on the same testing basis as the meter but also the demand register possesses the same stability of calibration as the watthour meter. This high degree of accuracy remains unchanged during life, and thus assures reliable operation for years. In comparison with other types of demand metering devices, the register is relatively unaffected by such variables as friction and climate.

REGISTER FLEXIBILITY . . . The versatility of design of General Electric's demand register offers the opportunity of converting the register to different scale classes, different electrical ratings, or any

available time interval. Standardization on one register ratio with a change in only the multiplier is but one of the many cost-saving methods which is available with only a demand register.

REDUCED INVENTORY . . . The opportunities for reduced inventory are unlimited with the use of demand registers. Any stock single-phase or polyphase watthour meter can be converted to a demand meter merely by substituting a demand register. This adaptability which results in reduced inventory and operating costs is unique only with demand registers.

IN SERVICE . . . A watthour meter can be readily converted to a demand meter simply by the interchanging of registers. Also, quick, easy, accurate and low-cost field testing can be realized with demand registers. With the use of a G-E self-checking adapter, the need for elaborate testing equipment and costly hours of labor is eliminated.

These facts offer you the greatest possible assurance that General Electric's demand registers are your most reliable means to low-cost demand metering.

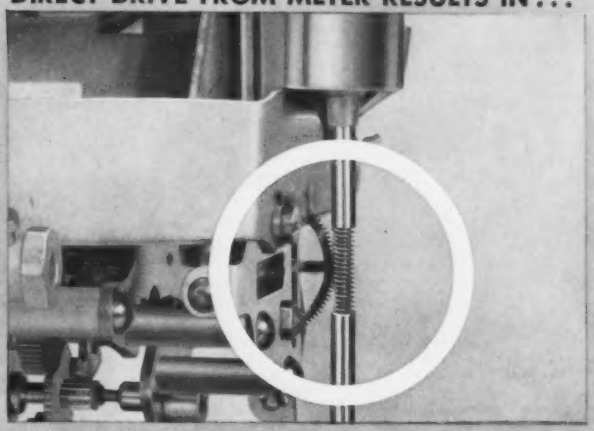
MANY UTILITIES . . . Increasing numbers of utilities are taking advantage of the benefits offered by demand registers. Here are but a few: Commonwealth Edison Company, Wisconsin Electric Power Company, Kansas Power and Light Company, Duke Power Company, Pacific Gas and Electric Company, Southern California Edison Company, Public Service Company of Oklahoma, and New Orleans Public Service Inc.

FOR MORE INFORMATION . . . If you would like more information on General Electric's mechanical demand registers, write to Section 621-12, General Electric Company, Schenectady 5, N. Y.

Progress Is Our Most Important Product

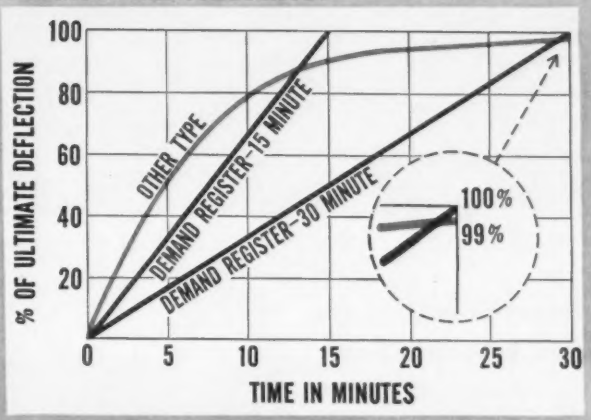
GENERAL ELECTRIC

DIRECT DRIVE FROM METER RESULTS IN . . .



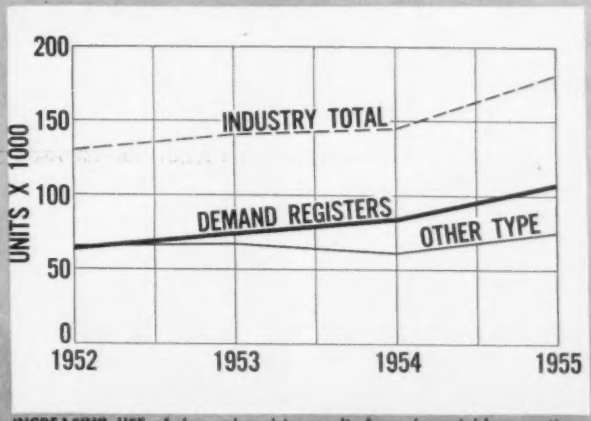
DIRECT GEAR DRIVE from the meter assures sustained accuracy for years.

DEPENDABLE ACCURACY



ONLY REGISTERS reach 100% of average demand after rated time interval.

INCREASING UTILITY USE



INCREASING USE of demand register results from dependable operation.

With factories in Anaheim, Los Angeles, Oakland, Ontario, San Francisco, San Jose, Seattle, and Richland, and Sales Offices in twenty Western cities.

Aerial cable carries workers out to drilling platform in middle of turbulent Lewis River

Cowlitz PUD to Apply For Lewis River Site

Cowlitz County, Wash., PUD commissioners have instructed the PUD's legal counsel to proceed with formal application to the Federal Power Commission for a license to construct a hydroelectric dam and power house at the Swift Creek site of the Upper Lewis River for which a preliminary permit has been issued the Pacific Power & Light Co.

The PUD had notified the FPC on April 17 it was interested in the site where PP&L proposes a $58,000,000 dam in a two power house development which is upstream from the investor-owned utility's Yale and Merwin Dams.

Yellowtail Land Price Gets President's Veto

President Eisenhower won the approval of Chief Yellowtail of the Crow Indian Council when he vetoed payment of $5,000,000 to the council for the Yellowtail Dam site.

The President called the amount "extravagant" and Chief Yellowtail said the dam is "hard to justify from any point of reasoning . . . the cost of reclaiming lands under the proposed irrigation project which will be $287.56 per acre is all out of proportion to the economics involved."

Upper Baker Construction Scheduled to Start Soon

A 50-year Federal Power Commission license granted recently opens the way for construction of Puget Sound Power & Light's Upper Baker hydroelectric project.

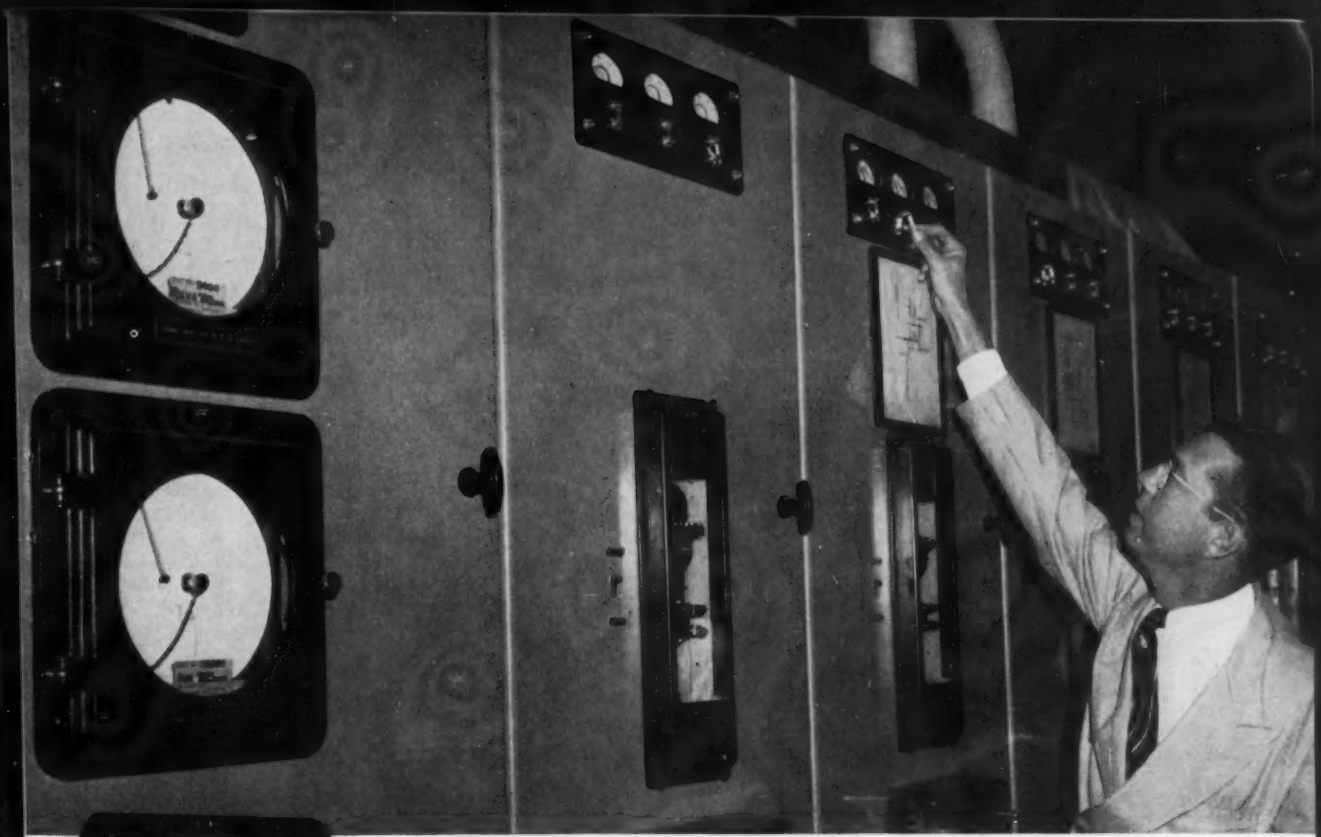
New generation from the project will total 140,000 kw. The existing Lower Baker power plant will have 55,000 kw added, and the new power house will have a generating capacity of 85,000.

The Baker River development is part of the Puget Sound Utilities Council large-scale program.

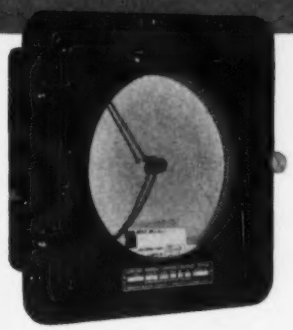
Intervention by the Washington State Departments of Fisheries and Game will be dropped if their recommendations for preservation of fish and wildlife are included in the license.

• **New distribution headquarters** to serve customers of Southern California Edison Co. in the San Bernardino area are now under construction. Offices, warehouse, garage and shop will be contained in the building, and a pole yard is adjacent. Cost of the project is $260,000.

Construction of this dam and power house, starting soon, on the upper Baker River near Concrete, Wash., for Puget Sound Power & Light, will be supervised by Stone & Webster Engineering Corp. Award of contracts will be made soon, the first for clearing the site



These Lincoln Semiflush Switchboard Graphics measure substation total load, both KW and KVA. Note individual circuit measurement with Lincoln Triplex Ampere Demand Meters at top of switchboard.

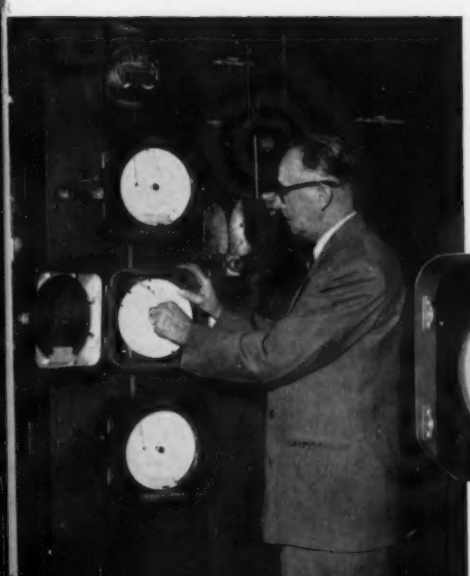


Put Substation Operating Data on Record with LINCOLN GRAPHIC METERS

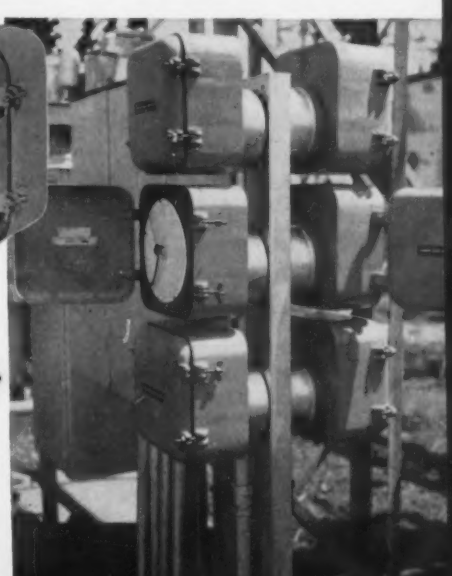
When knowledge of time and duration of loading conditions is required for system betterment—Lincoln Graphic Meters offer a simplified low-cost means of system measurement. Lincoln Graphics are thermally lagged to integrate minor fluctuations into a clearly defined line, making legible records possible on single charts up to 32 days.

Write today for full information on Lincoln Graphic Meters and Simplified Measurement for System Operation.

SANGAMO ELECTRIC COMPANY • Springfield, Illinois



Three surface-mounted Lincoln Type CCA Graphics measure main station bus current on 8 day charts.



Reactive and Kilowatt Lincoln Demand Graphics in paired sockets correlate feeder KW and RVA in an outdoor substation. These socket type graphics are merely "plugged in". The socket makes the correct connection for each meter.

SM56-2

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EXPLOSION PROOF LIGHT FIXTURES • SEALED BEAM FIXTURES

PGE Officials Cleared By Grand Jury Action

A threatened brush with the law was averted by Portland General Electric Co. when an Oregon grand jury refused to indict company officers for construction of Pelton Dam.

Attorney General Robert Y. Thornton had issued an opinion that PGE officers had violated the state hydroelectric law by starting construction without an Oregon permit. The company secured a Federal Power Commission permit.

After the grand jury decision, District Attorney Warren H. Albright of Jefferson County hinted at possible future legal troubles for PGE. He said: "The grand jury's opinion does not mean that future action will not be taken if the situation warrants such action. I will continue to investigate the matter and when appropriate action is indicated by my own investigations, or when called to my attention by others, I will proceed in accordance with the law."

One corral fence observation is that Albright might be waiting until work begins on a reregulating dam that is on private land outside the public domain containing Pelton proper.

Oregon, Forest Service Study Upper McKenzie

Oregon's Water Resources Board, highest authority on the state's water resources, and the U. S. Forest Service have begun a study of possible state and federal development of the Upper McKenzie watershed.

L. C. Binford, vice-chairman of the board, speaking in favor of the study, said: "Should the plan of use adopted by the forest service be in keeping with the classification or priority given the waters by the board we would accomplish almost complete control of the use and development of the area."

The study could affect the Beaver Marsh project of Eugene Water & Electric Board which is in the area. Although the city received an FPC license, a bond issue for financing was defeated by voters.

One instigator of the joint study is the Save the McKenzie Organization which was also instrumental in defeating Eugene's bond election.

• **A survey team** of 30 men will spend four months in the north mainland of British Columbia studying the hydroelectric potential of the Homathko River from Bute Inlet to Chilco Lake. The survey is sponsored by British Columbia Power Commission. A potential of 750,000 kw is believed feasible.

VICTOR PROGRESS REPORT #4

We use BLACK LIGHT to certify soundness of

VICTOR INSULATORS!

Soundness of insulator porcelain is of utmost importance to every power man. Tiny imperfections, too small for detection by eye alone, can bring about costly failure and interruption of service. VICTOR certifies the soundness of porcelain insulator bodies by the use of "black light." Before firing, insulators are sprayed with a fluorescent material, then subjected to a near ultra-violet light. This process detects the slightest imperfection in the body mass for subsequent rejection. It assures you of sound, perfect insulators, cuts costs, minimizes replacements, safeguards service. Another reason why VICTOR produces the best insulators that money can buy!

"BETTER INSULATORS THROUGH RESEARCH"

SPECIFY VICTOR Purified Porcelain Insulators!

VICTOR INSULATORS DIVISION
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Low and High Voltage Pintypes • Suspensions • Guy Strains
Spools • Switch and Bus Insulators • Custom Designed Porcelain
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Westinghouse
15

A 1956 transformer to help you sweat out heat storms

Here's a new and practical way to drastically reduce future heat-wave casualties. A 20% increase in operating range in the 1956 Westinghouse CSP® transformer permits carrying additional loads during periods of high ambient. This new overload ability has been made available at no sacrifice in service life.

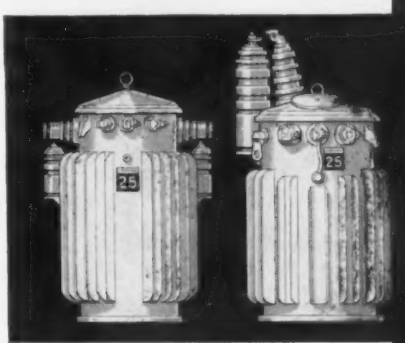
Over and above that, this CSP transformer is equipped to furnish a 15% additional emergency range by using the emergency control.

On the 1956 CSP transformers, the signal light will remain at the ASA level as on previous models. This means you will have extended operating range — or additional time before change-out to a larger rating. Where the signal lights are noted on a planned basis, you have TIME to make an area load check . . . TIME to make change-out on an orderly planned basis . . . TIME to assure customer service continuity with no burn-outs. These additional advantages are available on Westinghouse CSP transformers at no premium in cost.

The Completely Self-Protecting transformers are still provided with the time-proved advantages of (1) 3-point protection against lightning, (2) protection from secondary short circuits or long-time overloads, (3) protection from line lockout by means of an internal protective link.

For the complete story on the 1956 CSP transformer with increased breaker trip settings, call your Westinghouse sales engineer today, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-70765



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FOR AMERDUCTOR

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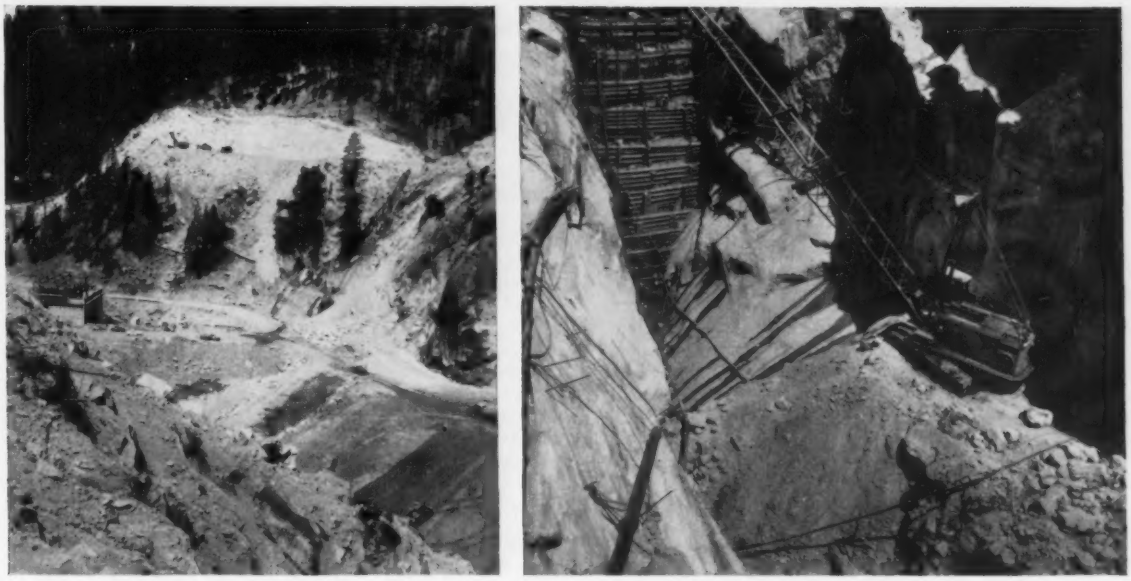

Photo at left shows Beardsley Dam under construction and the power house. At right is the cofferdam and excavation for Donnells

Partnership Builds Tri-Dam

More than 30 years of planning, perseverance and cooperation are behind a buzz of activity on the middle fork and main stream of California's Stanislaus River.

The Oakdale and South San Joaquin Irrigation Districts are building the Tri-Dam project, a series of three dams that will add 230,400 acre-ft of water storage for irrigation and power generation. A third party in the project is Pacific Gas and Electric Co., whose purchase of power will pay the entire cost.

Three new power houses will have a combined capacity of 81,000 kw, which will be delivered to PG and E at the bus bar, and the additional water storage will increase the output of the utility's existing Melones and Stanislaus power houses.

An interesting sidelight on the project, in these times of partnership development by local agencies, is that the two irrigation districts and the utility have been cooperating in the Stanislaus River development for the past 30 years.

In 1926, the districts built Melones Dam and PG and E built Melones power house. The districts are paid for falling water.

The present project, costing $52,000,000, was financed on the basis of a 45-year contract for sale of power to PG and E.

Physically the Tri-Dam project is comprised of Donnells Dam at the upstream end, Beardsley Dam, 12 miles lower, and Tulloch Dam, 45 miles below Beardsley. Donnells and Beardsley are on the middle fork and Tulloch is on the main stream of the Stanislaus River.

Each dam is a different type. Donnells is a concrete-arch, Beardsley an earth-fill and Tulloch a concrete-gravity type. Beardsley has the largest storage, 97,500 acre-ft, Tulloch stores 68,000 acre-ft and Donnells stores 64,500 acre-ft.

A 38,000-ft tunnel feeds water to the Donnells power house, which will have a capacity of 54,000 kw and is the largest of the three. Beardsley power house will generate 10,000 kw and Tulloch 17,000 kw. An outstanding feature of the power phase of the job is the penstock for Donnells, which will be 2,600 ft long with a drop of 1,200 ft.

Engineer Neville Long looks at Tulloch site

Donnells and Beardsley power houses, both equipped by Allis-Chalmers Co. throughout, will be linked by carrier system and telemetering so that Donnells will actually operate unattended. All controlling will be done from Beardsley.

Project engineer of Tri-Dam is B. W. Goodenough of Tudor-Goodenough Engineers. Builders are Tri-Dam Construction Co., comprised of Morrison-Knudsen Co., Macco Corp., Peter Kiewit Sons Co. and Stolte Inc., on Beardsley and Donnells, and Arundel Corp. and L. E. Dixon on Tulloch.

So, what began as a dream of R. E. Hartley, chief engineer of the Oakdale Irrigation District, in 1920 is fast becoming a reality. It will be providing valuable water and electricity in the latter part of 1957. It will stand as concrete evidence of what foresight, patience and cooperation of such organizations as PG and E and the Oakdale and South San Joaquin Irrigation Districts can accomplish.

KNOB and TUBE WIRING RUNS COOL AND CARRIES GREATER LOADS FROM 33% TO 100% MORE

HOT ? If you want your wiring to run **COOL,** install Knob and Tube Wiring. It's cooler—it's safer—it carries greater loads . . . from 33% to over 100% *more* than other methods. It's the answer to your adequate wiring problems. See NEC Tables I and II on conductor carrying capacities.

Specify Porcelain Products' Knobs and Tubes for better Knob and Tube Wiring.

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Washington State Plans To Build Steam Station

J. Frank Ward, managing director of the Washington State Power Commission, has confirmed a report by Rep. Hal Holmes (R, Wash.) that the Bonneville Power Administration has submitted a proposal for furnishing dump power to the commission to permit construction of a coal-fired steam power plant in the Roslyn-Cle Elum area.

The proposal is under study, said Ward, but details were not disclosed. Ward previously has declared that, if dump power could be obtained at an attractive rate, construction of the steam plant would be feasible.

Holmes, who represents the area in Congress, said the proposal was reported to be "generally acceptable" to the commission.

The commission has been considering plans for a 300,000-kw steam plant, which would be operated at least six months a year. Coal mines in the Rosyln-Cle Elum area are seeking new markets, with supply exceeding the demand.

Bids and Contracts

• **Fluor Corp.** Ltd. has the contract to design, erect and supervise the preliminary start-up of the second of four 60,000-kw steam electric generating units for California Electric Power Co. at its new San Bernardino plant. Fluor is currently building the first unit.

• **S. Morgan Smith** Co. will supply two 42,000-hp hydraulic turbines for Montana Power Co.'s H. H. Cochrane project. Three more hydro units have been ordered by the Corps of Engineers for Ice Harbor development. Each is rated at 143,000 hp.

• **Pacific Switchgear** Division, Federal Pacific Electric Co., reports orders for oil circuit breakers for Pacific Gas and Electric Co. that total more than $1,055,500 kw of new generating capacity under construction or planned.

• **Kaiser Engineers** Division of Henry J. Kaiser Co. is sponsoring a group of contractors that will build one of the world's largest earth and rock fill dams in the world. The dam will be located in New South Wales, Australia.

• **Charles L. Harney** Co. has the Pacific Gas and Electric Co. contract for earth moving work for expansion of Hunters Point power plant, San Francisco.

• **Key Construction** Co. has received a contract from Portland General Elec-

INDIANA STEEL & WIRE CO. MUNCIE, IND. Crapo Galvanizing

Signs along the lines of *Crapo* GALVANIZED STEEL STRAND PERFORMANCE

For dependable performance . . . insist upon *Crapo* Galvanized Steel Strand. Superior tensile strength, combined with long-life, ruggedness and workability, makes *Crapo* Steel Strand first choice for guys, messenger and overhead ground wire.

The famous *Crapo* galvanizing process provides dependable protection for the steel, prolongs the expectant life of the strand.

- Low maintenance cost
- Laboratory tested and controlled quality
- Meets highest quality standards
- A size and grade for all practical needs
- Contact your *Crapo* Jobber Today!

INDIANA STEEL & WIRE CO., INC.
Muncie, Indiana

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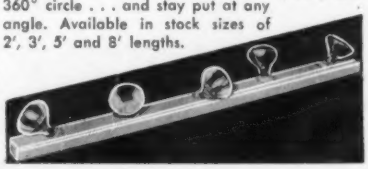
NEO-RAY ROTO-STRIP C.S.A. APPROVED Pat. Pend. FOR FLOODLIGHTING PLANT AREAS

ROTO-STRIP provides adequate, inexpensive lighting for plants. May be placed on ceilings, trusses, beams, walls, floors, platforms, etc. Used by leading corporations throughout the country.

ROTO-STRIP is a complete shallow unit (available for surface, corner or recessed mounting) with built-in recessed roto sockets that swing 90° in all directions through a complete 360° circle . . . and stay put at any angle. Available in stock sizes of 2', 3', 5' and 8' lengths.

Surely Roto-Strip has a place in your plans.



California Nevada
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tric Co. for construction of transmission lines from Pelton Dam to Round Butte, and an interconnect with Bonneville and Pacific Power & Light Co. Contract is for $96,000.

• **Packard Electric** Co. Ltd., has been awarded a contract to supply and supervise installation of four 25,000-kva transformers for the new gas-turbine thermal generating station of British Columbia Power Commission. Amount of the contract is $244,400.

• **Dawson, Wade** & Co. and Macco Corp. have received an $856,914 contract to relocate logging roads to be inundated by British Columbia Power Commission's Upper Campbell development.

Bonneville Awards

Bonneville Power Administrator announces the following contract awards made in May and June.

John L. Nichols Construction Co., $25,411, construction of a four-mile tap line from Keeler substation to the St. Johns-Oregon City line, and a one-mile St. Johns-Forest Grove loop line to Keeler substation.

Joe E. Venne, $63,283, construction of control house additions at Franklin substation.

W. L. Ridge Construction Co., $201,719, construction of the 23-mile Big Eddy-Parkdale section of the Big Eddy-Oregon City 287-kv transmission line.

A. T. Fox, $34,706, construction of a 115-kv capacitor and facilities for a second transformer at Reedsport substation.

Cascade Hauling Co., $8,644, grading and fencing the site for Silver Creek substation.

Witzig Electric Co., $16,821, construction of new additions to Franklin substation.

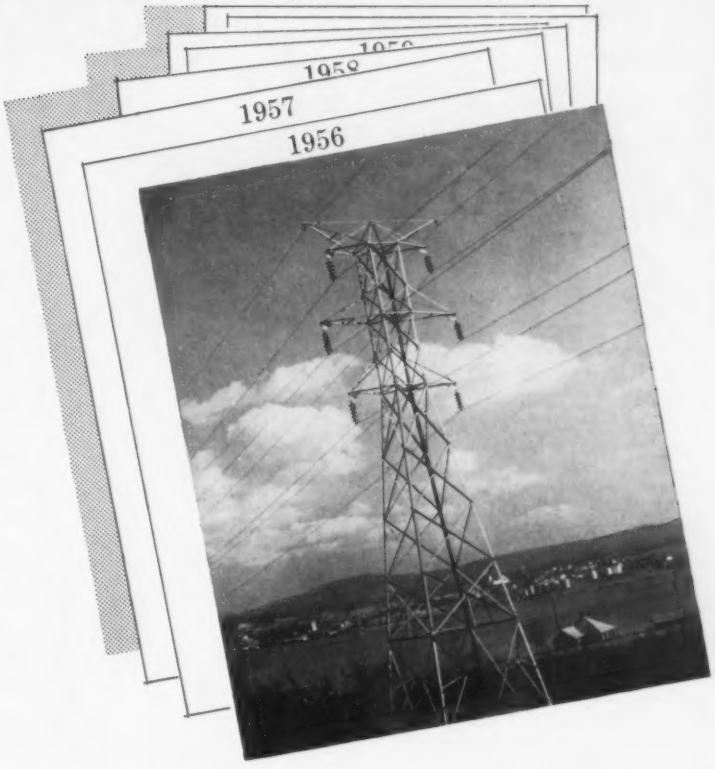
Olson Electric Co., $16,501, construction of additions to Naselle substation.

Pettijohn Engineering Co., $159,972, for construction of two sections of the J. D. Ross-St. Johns-Keeler 230-kv transmission line and a 115-kv tie line at Keeler substation.

Murray Bros. Construction Co., $209,160, clearing right-of-way and construction of access roads for Drain Tap Point-Umpqua River section of the Alvay-Reston 230-kv transmission line.

Barnes Electric Co., $17,635, for dismantling Hungry Horse substation, moving equipment to a new site west of Richland, Wash., and constructing Ledbeder substation.

Western Electrical Construction Co., $17,187, construction of Long Beach substation.



YEARS OF PROTECTION
FROM A SINGLE COAT of Subox

Some of America's greatest utility companies use a single, thrifty coat of Subox* or Subalox* paint to give them many years of anti-corrosive protection.

The life of a Subox paint job averages 5 to 8 years without any chipping, cracking or blistering. Subox paints effectively resist moisture, fumes, most industrial exposures and also abrasive conditions.

You can securely rely on Subox paints to lower your maintenance budgets, for Subox costs no more than any good paint and saves you money over the years.

Write for a copy of "Corrosion Control of Electrical Structures and Equipment."

*Trade Mark

Established 1924
18 Fairmount Plant, Hackensack, N. J.

Subox Inc.

The only paint in America made with suboxide of lead: chemically-active rust-inhibitive and anti-corrosive agent.

See Catalogues in Sweet's Industrial and Engineering Files

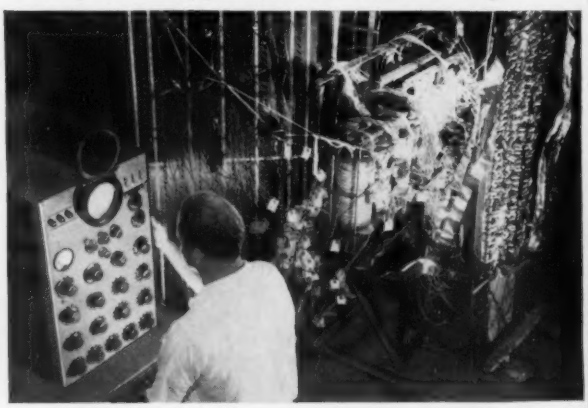
OPTIMUM INVESTMENT*
Power Transformers

*Optimum Investment

Your assurance of lower long-term cost, plus greater dividends from your investment in General Electric large power transformer, through:

- **LOW ENGINEERING COST:** G-E field services reduce your engineering expense.
- **LOW PURCHASE COST:** Skill to produce optimum design for each application.
- **LOW INSTALLATION COST:** Upright shipment, one-piece tank speeds handling.
- **LOW OPERATING COST:** Permanent, better characteristics for lasting economy.
- **LOW MAINTENANCE COST:** Product improvements, greater reliability reduce outages.

INTERNAL THYRITE*, an amazing non-linear resistance material, gives ideal overvoltage protection to partial or complete sections of transformer windings. Located next to and connected in parallel with the coil, Thyrite acts like a safety valve and by-passes excessive currents and voltages.



ELECTROMAGNETIC MODEL determines impulse voltage distribution in a transformer before the actual unit is built. Due to remarkable similarity in characteristics between model and completed transformer, the unit can then be built with the correct amount and location of insulation.

Improvement of Power Transformer Design Features Leads to . . .

A 300% INCREASE IN RELIABILITY; UTILITY SAVINGS OF $10,000,000 IN 1955

Product improvements speed trend to three-phase units, reducing utility capital investment in transformers

How reliable are today's power transformers? A recent study indicates that General Electric power transformers have become three times more reliable in just twenty years.

ANALYSIS OF RECORDS was made to determine how many transformers, 15,000 KVA and above, succumbed to lightning or faults within the first five years of service. Transformers built in two periods—1928 through 1930, and 1948 through 1950—were compared. G-E records show that the number of failures, already small, was further reduced by 75% on the basis of the number of units shipped, and 84% on a KVA-shipped base. Also, since 1950, further product improvement has reaffirmed this 300 per cent increase in power transformer reliability.

During the late '20's, many installations consisted of single-phase, rather than three-phase units. As transformers became more reliable, the trend to three-phase installations grew, saving users of General Electric power transformers over $10,000,000 in 1955 alone—comparing units actually purchased to what would have been bought based on the utility practices of the late '20's.

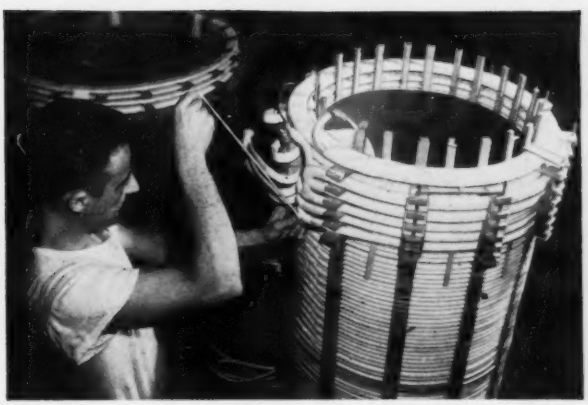
EXTENSIVE DEVELOPMENT of new and better G-E power transformers features has keynoted this trend. For instance, Thyrite* resistors help guard against winding overvoltages caused by line surges; electrostatic shielding helps prevent damage from lightning impulses; electromagnetic models assure the use of proper impulse-resisting insulation; and special core and coil bracing keeps the unit rigidly strong. All contribute to improved reliability.

These are examples of features designed to reduce your maintenance costs. There are more. And, combined with other features that give you low engineering, purchase, installation, and operating costs, they make your General Electric Power Transformer an *Optimum Investment.* General Electric Co., Schenectady 5, N. Y. 421-44

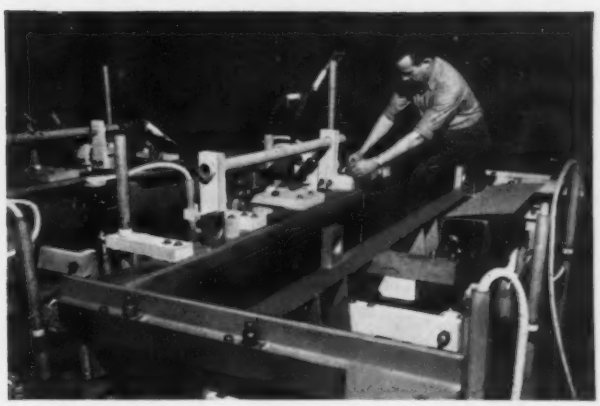
*Registered Trademark of General Electric Co.

Progress Is Our Most Important Product

GENERAL ELECTRIC



ELECTROSTATIC SHIELDING combats the tendency of lightning-caused impulse voltages to overstress the insulation by distributing themselves across only a few turns of the winding. Shielding evens out the voltage distribution throughout the winding and helps prevent insulation breakdown.



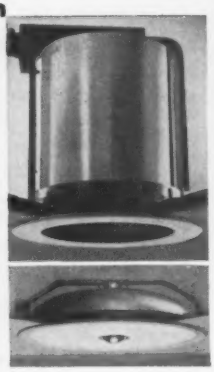
CORE AND COIL CLAMPING forms a rigid, compact structure of the myriad of component parts of the assembly. As surges and fault currents course through a transformer, exerting severe stresses on the assembly, the clamping resists these forces and helps protect the assembly from being distorted or damaged.

Recessed lighting creatively engineered!

kurt versen

VERSEN RECAL

VERSEN RELUX



To meet every application for efficient accent lighting and general illumination, Kurt Versen has engineered a wide selection of recess units. They are available in wattages from 40 to 500 watts.

kurt versen

CUT INSTALLATION TIME IN HALF!

Patented Versen NO-FRAMING* method of installation is completely flexible for both dry and plaster ceilings. Flush fit. No visible screws.

A typical example of time-saving, money saving Versen NO-FRAMING method of installation.
Yoke with wireway, splice box and pull-up screws.
Plaster ring with DCM clips and screws
Reflector dome.

*Covered by U.S. Patents 2,456,903 and 2,614,785. Other patents pending.

kurt versen company

Englewood, New Jersey, 32

Write today for latest information on creative recessed lighting by Kurt Versen.

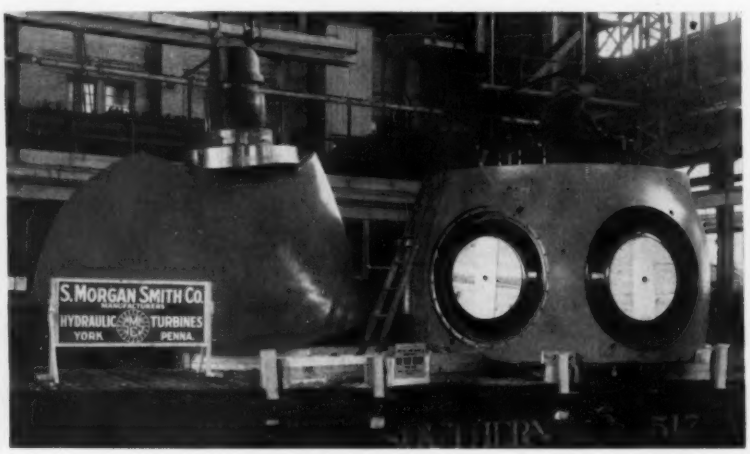
Contemporary lighting creatively engineered.

William Ray shows Harry Pearl and Wally Ahnstrom, State Electric Supply, how bar works

NOTES ON THE TRADE

• **General Controls** Co., commemorating 26 years in the Bay area, held an open house in its new San Francisco building at 600 Bryant St. Chief "conversation piece" at the well-attended reception was a $4,000 automatic bar designed and conceived by Huntly Briggs, General Controls assistant advertising manager, as an interesting way to show General Controls at work. Most entertaining feature of the bar is the glaring "tilt" sign that flashes at the person who dials for too strong a drink. On hand for the occasion were President William A. Ray and Vice-president John F. Ray and their wives.

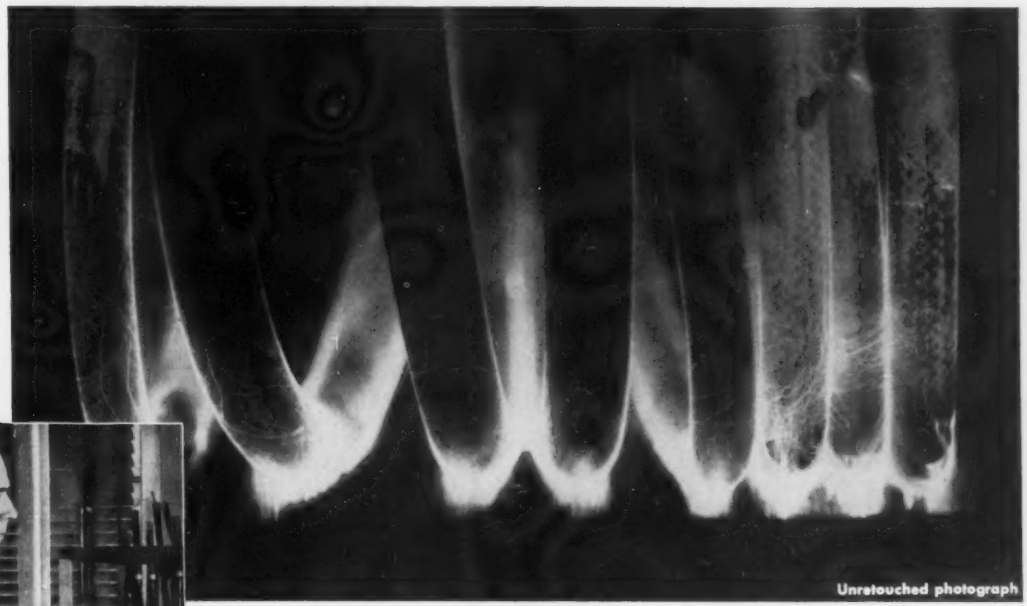
• **Amco Plastic Pipe** Co. has broken ground for a 45,000-sq-ft plant at San Leandro, Calif. The expansion reflects a growing demand for the company's plastic pipe and conduit.



McNary power house will be the home of this Smith-Kaplan hydraulic turbine hub and one of its blades. It is the last of 14 to be installed at McNary since September 1953, and will be in operation this fall. Smith-Kaplan rates the units at 138,000 hp

US RUBBER

GRIZZLY® POWER CABLES



Unretouched photograph

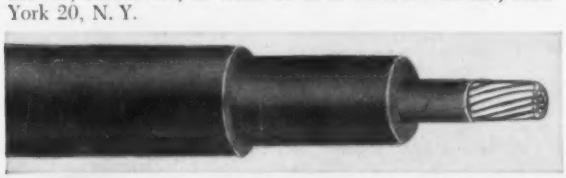
Under High Ozone Attack resulting from excessive voltage outlast 9 other leading brands tested!

In United States Rubber Company's special wire and cable testing laboratory, scientific devices record how cables react under abnormally high voltage.

In this test, 6 samples of 5 KV unshielded U. S. Grizzly Power Cables were pitted against 26 other 5 KV samples made by 9 leading competitors. Lengths were bent into U-shapes, roughly 8 times the cable's over-all diameter. They were then placed upright on a grounded metal plate with bottom of "U" resting on plate. Then a conductor-to-plate potential of 40,000 volts was applied. The test was allowed to run until all cables failed, with elapsed time to failure carefully checked for each. The accompanying chart shows dramatically the overwhelming superiority of U. S. Grizzly Power Cable.

U. S. Grizzly Power Cables are obtainable at your "U.S." branch, distributor, or write us at Rockefeller Center, New York 20, N. Y.

Manufacturer	No. of samples tested	Elapsed time to failure—in hrs. Lowest value	Highest value
"U.S."	6	2941	6030
A	2	0	3
B	5	0	92
C	2	0	.6
D	3	12.5	144
E	3	300	490
F	2	30	46
G	6	.1	2509
H	2	0	0
I	1	25	25

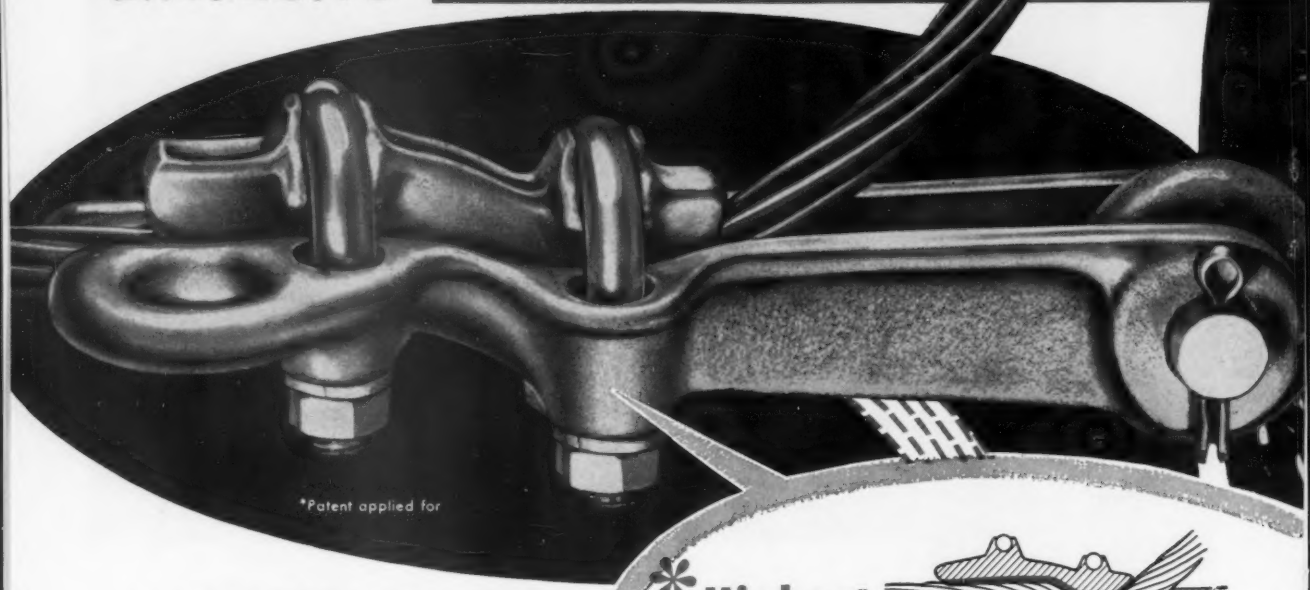


US RUBBER

Electrical Wire & Cable Department

United States Rubber

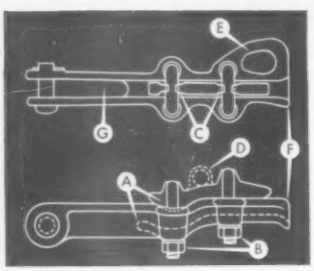
Anderson's New, Exclusive SNUB SEAT



*Patent applied for

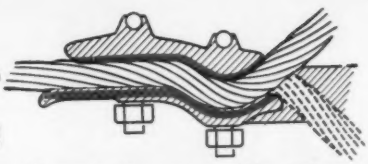
Type ADE straight dead end clamp

Here is the finest straight line clamp money can buy... with greater holding power and more outstanding "working" features than any other comparable clamp on the market today!



They're built for long, trouble-free service. (A) The body and keeper are high strength cast #356 aluminum alloy, heat treated. (B) Conductor can be inserted through clamp without removal of nuts. (C) U-bolts peened to unit keeper to facilitate ease of hot-line work. This *one-piece* assembly of U-bolt and keeper distributes pressure over large area and prevents damage to cable. No liners are required. (D) "Lifting" eye optional for use in hot line work. (E) "Come-along" eye for ease of sagging cable. (F) Flared mouth protects cable from chafing and crystallization due to vibration. (G) Adequate length for conductor to clear insulator disc . . . cable can be extended either above or below.

Highest Holding Power of any Comparable Clamp



Pull Test Data . . . holding strength in pounds

1/0 ACSR—3850 2/0 ACSR—4150
4/0 AL —4050 4/0 ACSR—5400
336.4—18/1 ACSR—8950

Five Sizes for Complete Range

See *the table below.* The slip-strength of the clamp is a minimum of 90% of rated-breaking-strength of all-aluminum cables within clamp range.

RECOMMENDED for ALL-ALUMINUM and ACSR CABLE

CATALOG NUMBER	CLAMPING RANGE IN INCHES Minimum	Maximum
Type ADE-46	.18	.46
Type ADE-60	.36	.60
Type ADE-70	.46	.70
Type ADE-86	.55	.86
Type ADE-98	.68	.98

For more complete information consult your nearest ANDERSON representative

Aluminum and Bronze POWER CONNECTORS • CLAMPS • FITTINGS • ACCCESSORIES for SUBSTATION • TRANSMISSION • DISTRIBUTION

ANDERSON ELECTRIC
CORPORATION
P. O. DRAWER 2151 • BIRMINGHAM 1, ALABAMA

*Formerly Anderson Brass Works, Inc.

• **Westinghouse Electric** Corp. has announced a lightning arrester training program for electric utility engineers. The highly technical course will be taken directly to the utility by a Westinghouse engineer the first time; a qualified utility man will carry on with subsequent courses.

• **Donal** Co. is now Portland sales agent for **Furnas Electric Co.**

• **Locke Department** of General Electric Co. will be called the **Insulator Department** in the future for closer identification with its products.

• **Western Electronic Show & Convention** headquarters reports that 706 exhibits are booked for its Aug. 21-24 affair at the Los Angeles Pan Pacific Auditorium. More than 30,000 are expected to attend.

• **Kaiser Engineers** Division of Henry J. Kaiser Co. has started a study on radioactive waste control for the U. S. Navy. Research operations will be undertaken by the U. S. Naval Radiological Defense Laboratory, San Francisco; Kaiser Engineers will evaluate alternatives.

• **Henry T. Clinkaberry** and **Robert D. Getzelman** are new service engineers attached to the Los Angeles office of Barber-Colman Co.'s Wheelco Instruments Division. The Seattle branch office of the company has moved to Room 206, Administration Bldg., Boeing Field, and has a new telephone number, Mohawk 4820.

• **Atomics International** announces selection of three new department chiefs and a new superintendent of manufacturing. Department chiefs are **Dr. F. E. Faris, Dr. E. E. Motta** and **Dr. Alan Andrew;** superintendent is **D. N. Petersen.** Two other appointments are: **R. L. Olson,** chief of project engineering, and **Dr. A. B. Martin,** director of technical sales.

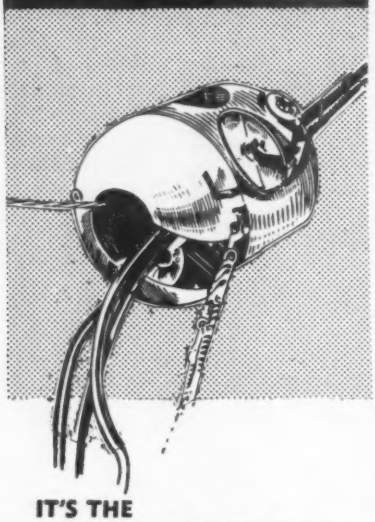
• **Alvis C. Elufson** and **Russell M. Smith** have teamed up to form Elufson-Smith Co., manufacturers' representative for Marco and Progress lighting fixtures. **Don Bosio** is also associated with the new firm, and will be calling on clients in the Bay area and later in the San Joaquin Valley. Address of the new company is 1139 Mission St., San Francisco 3.

• **General Electric** Co. reports receiving a government construction permit for its Vallecitos, Calif., boiling water reactor. This gives an AEC green light to G-E for the atomic experimental laboratory.

Bert Heinz (left) and Freeman Scharr, manufacturers' representatives at Seattle, are sharing a new location on the Marina Mart, at 1500 Westlake N. Designed as a show room and office, the new quarters have 100 f-c general lighting and are equipped to demonstrate all types of fixtures. An Accesso Systems ceiling allows fixtures to be changed as required. All units are controlled by low-voltage relays and selector switches, permitting operation of one or more as desired. When all are in use desk-top illumination level is 300 f-c. Floods, spots and color reflectors are provided for night displays and to highlight merchandise. The office and adjoining conference room are used for sales meetings and demonstrations to architects, engineers and other groups. Shown with Heinz and Scharr in the picture is Edith Perry of the Heinz Co.

Winners for the second time of an outing to Sun Valley with their wives were these Northwest district men of Construction Materials Division, General Electric Co., snapped by Les Johnson of Salt Lake City, who was one of them. Left to right were R. C. Dean, manager of field sales operations from Bridgeport; R. D. Graham, manager, contractor materials sales, wiring device department, Bridgeport; Lloyd Shackelford, wire and cable specialist, Seattle; Howard W. Black, general manager of the division, Bridgeport; R. C. Schey, new district manager, Northwestern district, Seattle; Weldon D. Hatenburg, district representative, Seattle; Ray Elmandorff, manager, marketing, conduit products. Bridgeport; Floyd Good, district representative, Portland; and W. W. Bryan, former Northwest district manager, now Pacific district manager, Los Angeles. The contest was initiated by Larry Walker when vice-president and general manager of Construction Materials Division. He is now commercial vice-president for G-E, San Francisco

THREE TO ONE



IT'S THE
NEALE MODEL "K"
Only the
Model "K" Spinner
PLACES & SPINS
THREE SINGLE CABLES
Into
ONE COMPACT UNIT

ALSO SPINS SINGLE CABLE PERFECTLY

WRITE FOR LITERATURE AND PRICES

CABLE SPINNING EQUIPMENT CO.
3100 TOPEKA AVE.
TOPEKA KANSAS
Phone 2-7234
OVERSEAS SALES:
Ericsson Telephone Sales Corp. of New York
Automatic Electric of Canada
Pirelli of Great Britain

• **Line Material** Co. has opened a new sales office and warehouse at East 3303 Ferry St., Spokane. Headquartering there are W. F. Smith, Mountain States division manager; R. A. Balch, field engineer; T. J. Chapman, lighting engineer; and C. J. Carter, fiber products engineer. Branch Supervisor P. K. Christiansen handles warehousing activities.

• **Hyde Sales** Co., Denver, is a new representative of Marion Electrical Instrument Co. Its area is Colorado, Utah, Idaho, Wyoming and Montana.

• **Canadian General Electric** executives have indicated that some expansion of the company in Vancouver, B. C., may take place. James H. Goss, president, and H. M. Turner, chairman of the board, were recent visitors.

• **Ralph Seiler** has been promoted to sales manager of Triad Transformer Corp.'s industrial division.

Hamil

Hamil Is Administrator Of Nation's REA Group

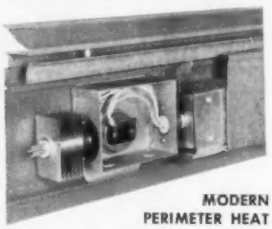
"There are no strings on me. My obligation in accepting the job is to give fair and impartial treatment to all."

These were the words of David A. Hamil, 47-year-old Coloradan who is now REA administrator. He was talking at a safety meeting of the Highline REA at Fairfield, Colo. He had earlier told newsmen that he planned no immediate changes in REA policies and intended to "follow the program as laid out by Ancher Nelsen until I get my feet on the ground."

BRONCO 66
CABLE
POWERS
the
MUSCLES
of
INDUSTRY
WRITE for the complete story of BRONCO 66 CERTIFIED, the dependable, extra flexible, electrical cables through which energy flows to the power tools of industry. These Synchro-Cured portable electrical cords and cables are made with a branded jacket certified to contain not less than 67.32% Neoprene.
Send for free brochure to:
WESTERN INSULATED WIRE CO., Los Angeles 58, California
ASK YOUR ELECTRICAL WHOLESALE DISTRIBUTOR FOR THE CABLE WITH THE 66% NEOPRENE JACKET

HEATSUM
ELECTRIC
BASEBOARD

(Illustration of cut-a-way section)



MODERN PERIMETER HEAT

SAFE—Low surface temperatures and safety cutout protects furniture.
2-HEAT, AUTOMATIC CONTROL — thermostat switches from high to ½ heat automatically. (Normally operates on ½ heat.)
HIGH CAPACITY—3000 watts in 8-foot unit on high heat. Less WALL SPACE required.
BASEBOARD UNITS—available in many lengths and wattages. They are designed for a completely harmonized installation in any room. Units may be joined; blank sections available for extensions.
EASY TO INSTALL—Units attach to wall surface in new or existing buildings.
All Baseboard units have two elements and can be used with our No. 332 Thermostat for 2-heat control.

Send for free folder

ROBERSON Inc.
1539 East 103rd St., Seattle 55, Wash.

NEWS ABOUT PEOPLE

• **Albert Cage,** president of California Electric Power Co., is one of 70 U. S. business and civic leaders attending a joint civilian orientation conference in Washington, D. C., called by Defense Secretary Charles Wilson.

• **Re-elected** for second terms recently were **Victor I. Corbell,** president of the Salt River Valley Water Users Assn., and **Bert M. Pringle,** vice-president. The association controls the Salt River Power Project.

• **John D. Ferguson** is new Superintendent of Tacoma City Light. He succeeds **Henry A. Cole** who assumes the new position of manager of the major projects division. Cole will direct activities such as the Cowlitz River project and Cushman power expansion.

• **A new appointment** announced by British Columbia Engineering Co. Ltd., a subsidiary of British Columbia Electric Co., is Henry W. Smith to assistant general manager. B. C. Electric announces two appointments. **W. Fraser Miles** is new assistant chief engineer and **G. F. Green** is executive assistant to the chief engineer.

• **Dean Barline,** director of utilties at Tacoma, has been elected chairman of the Puget Sound Utilities Council.

• **R. A. Neill,** former executive secretary of the Montana Taxpayers Assn., has been named research consultant for Montana Power Co.

• **Professors Joseph S. Carroll** and **William G. Hoover** of the Stanford Department of Electrical Engineering attended the International Conference on Large Electric Systems, Paris, France.

• **T. Ivan Usher** will head up a new community relations division in the Tacoma City Light organization. Serving with him are **E. Z. Fredricks,** commercial sales supervisor; **Carl Ostlund,** customer service supervisor, and **William Dugovich,** public information officer.

• **Paul A. Blanchard** has been promoted by the board of directors of Utah Power & Light. His new title is assistant vice-president. He has been with the company since 1923.

M|F

malleable iron

HIGH CORROSION RESISTANT

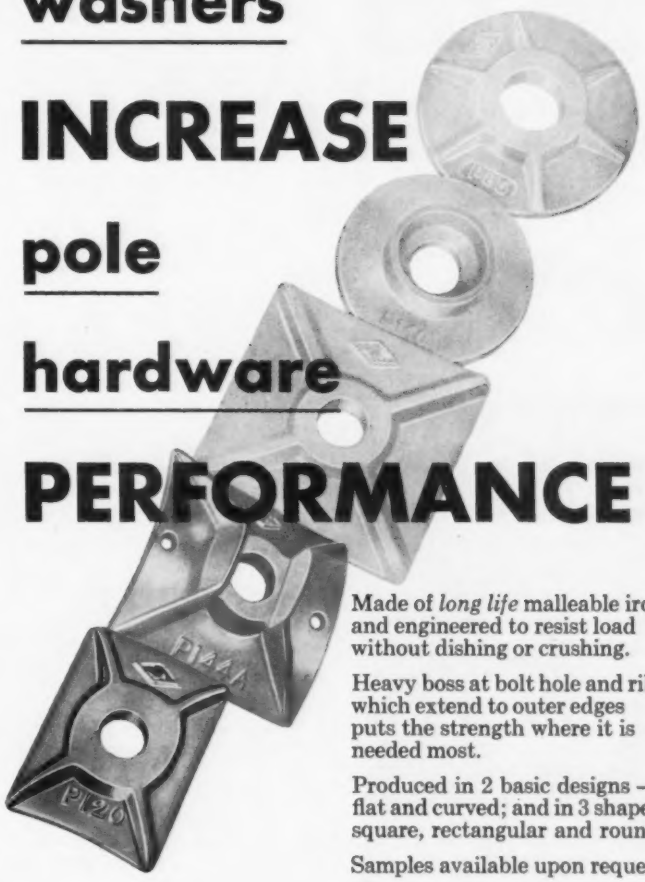
washers

INCREASE

pole

hardware

PERFORMANCE



Made of *long life* malleable iron and engineered to resist load without dishing or crushing.

Heavy boss at bolt hole and ribs which extend to outer edges puts the strength where it is needed most.

Produced in 2 basic designs — flat and curved; and in 3 shapes, square, rectangular and round.

Samples available upon request.

For further information
Write for Bulletin PH 5

MALLEABLE IRON FITTINGS COMPANY

POLE HARDWARE DIVISION Branford, Connecticut
N. Y. Office: 30 Church St.

M|F

Canadian Mfr. & Dist.: LINE & CABLE ACCESSORIES, Ltd. TORONTO

Representatives: William J. Cottrell Co., Portland, Ore. • James H. Drew Corp., Indianapolis, Ind. • Industrial Engr. & Equip. Corp., Los Angeles, Cal. • JSG Electric Co., Chicago, Ill. • Lee-Smith Co., Miami, Fla. • B. H. McCoin, Knoxville, Tenn. • William J. O'Brien, Memphis, Tenn. • Robert P. Smith & Co., Jacksonville, Fla. • E. A. Thornwell, Inc., Atlanta, Ga. • J. P. Voight, Summerville, S. C. • Waltham, DeWitt & Krusi, San Francisco, Cal. • L. G. Wendegatz, Kansas City, Mo. • Williamson Sales Co., Shreveport and New Orleans, La.; Dallas, Houston, Tex.; Pine Bluff, Ark. • O. C. Witte Co., Detroit, Mich.

Before: Beat-up

Now: Like new!

G-E Service Shop

Your local G-E Service Shop uses mass-production methods when it rebuilds your old distribution transformers. Result: high-quality work at low cost . . . prompt pickup and delivery . . . and no worries for you. And you get new-unit warranties! There are 31 G-E Service Shops throughout the country—one near you. 431-32

Progress Is Our Most Important Product

GENERAL ELECTRIC

• **American Power Dispatchers** Inc. members, at the spring meeting in Arcadia, Calif., elected B. P. Bengtsson, Los Angeles Department of Water & Power, national president. C. H. Jackson, same utility, is national vice-president; S. I. Robbins, Southern California Edison Co., national secretary-treasurer; R. W. Stinebaugh, Pasadena Municipal Light & Power, Southwest Area chairman, and William Yauk, same utility, Southwest Area secretary.

• **Electric Club of Washington's** new president is G. A. O'Brien, Seattle manager for Phelps Dodge Copper Products Corp. Other new officers are: R. L. Lemman, Line Material Co., first vice-president; Howard Bayley, Industrial Electric Co., second vice-president; Dick Church, Puget Sound Power & Light Co., treasurer; Ray Galenbeck, Anaconda Wire & Cable Co., secretary.

• Changes in the design section of San Diego Gas & Electric's engineering department resulted in these appointments: **George B. Kenline,** assistant chief design engineer; **Melvin J. Cox,** design engineering supervisor; **Harry C. Zalabak,** office engineer; **John O. Koopmans,** field engineering supervisor.

• **John S. Jennings,** former manager of Incandescent Supply Co.'s Redding branch, is now manager of the Sacramento branch. He will be succeeded at Redding by **John W. Hylton,** former Sacramento assistant manager.

• **Walter Rubin** has been chosen to succeed the late Joseph Liner as West Coast representative for Rodale Mfg. Co. Inc. He will headquarter at 338 E. Second St., Los Angeles, and serve California, Arizona and Nevada.

• **Frank Bort** has been named manager of industrial construction, and **Stanley Kimball** is manager of heavy construction, for Kaiser Engineers Division of Henry J. Kaiser Co.

• **Austin E. Olson** has been named industrial communications engineer for Motorola Communications & Electronics Inc. in California, Arizona and Nevada.

Deaths

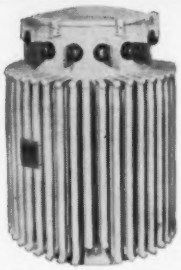
• **William G. Mills,** Spokane, and **Jack E. Annable,** Lynwood, Wash., died in a plane crash on Orcas Island May 29. Both men were representatives of RT&E Corp., covering the Northwest and Alaska.

MEET THE NEW

167 KVA

Featherweight

PENNSYLVANIA POLE STAR DISTRIBUTION TRANSFORMER



★ Will replace any single phase 75 or 100 Kva Pole-mounted Transformer to provide 67% to 123% more capacity.
★ Weighs less than 1500 pounds.
★ Lower in overall height than average 100 Kva transformer.
★ Available in standard voltages up through 13,200 volts.
★ The FIRST 167 Kva transformer made for direct pole mounting.

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510 West 6th Street, Los Angeles
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in the Electrical West . . .

THE NEXT 5 YEARS GROWTH WILL EQUAL LAST 10!

Power system budgets in the 11 Western States for 1956 total a record-breaking $831,218,000.

Power generating plants and dams authorized, started and awaiting FPC license will increase the West's power production facilities 56% by 1960. This represents 11,500,000 kw of capacity—as much a gain as was added in the last 10 years when Western growth paced the industry.

Look at this breakdown of new Western electrical construction:

1956	1,535,450 kw
1957	1,661,500 kw
1958	3,073,150 kw
1959	2,961,050 kw
1960	2,361,100 kw

During 1956, Western power systems are building:

2,866 miles of transmission lines	up 27% *
6,990 miles of distribution lines	up 4% *
6,231,502 kva of transmission substation capacity	up 80% *
2,312,173 kva of distribution substation capacity	up 30% *

* over 1955

Your sales will expand in the growing West if you advertise in

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Just ask us for an alloy we haven't got — we'll be delighted.

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PROFILES

N. R. Sutherland, right, president of Pacific Gas and Electric Co., accepts the 1,000th multimillion-kva circuit breaker made by Pacific Electric Switchgear Division of the Federal Pacific Electric Co. from Joseph S. Thompson, president of Federal Pacific. At a celebration June 28 in San Francisco, Federal Pacific acknowledged both the production milestone and its 50th anniversary

At Salt Lake regional NECA meeting, below, were District 8ers Ad Woolley, Idaho Falls, Utah-Idaho Chapter governor; Harold Whitney, Colorado Springs, president, Southern Colorado Chapter; and Ralph Johnson, Denver, a past vice-president, now governor, Rocky Mountain Chapter. In the Puget Sound Chapter contingent—Frank Holert Jr., past president; Oscar Olson, new president; John Majerus, chapter manager

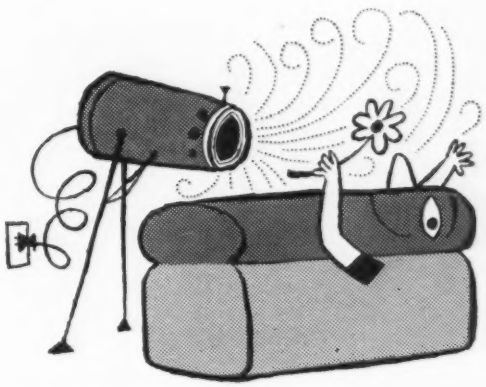
Woolley Whitney Johnson

Holert Olson Majerus

Can these new electronic marvels save you money?

The new techniques in electronics are limitless . . . are helping many businessmen make better products at lower cost. Here are four of the newest which may help you:

Electronic "detective" hunts transient metals. Powerful, new metal detectors now "frisk" plastics, wood, rubber, textiles for transient metals—and *find* them—even when deeply embedded.



Electronic "gun" keeps bread fresh for months. Smaller, lighter generators of electron beams now destroy bacteria, moulds, yeast — sterilizing foods and drugs without changing flavor or appearance.

"Silent sound" scrubs tiny component parts. Improved ultrasonic generators now clean tiny component parts in *seconds,* where cleaning by hand has been costly, even impossible.

TV gives "superman sight" to industry. New, small TV cameras let operators peer through walls, around corners, under ground—even watch highly dangerous operations in complete safety.

New techniques in electronics exist in almost every field. We'll help you get information on techniques that apply in your field.

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* *Means* **HOUSEPOWER** *in any language . . .*

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Your key to bigger and better markets and sales is full HOUSEPOWER, the electric industry's new concept in the promotion of adequate wiring. Take advantage of this industry-wide concerted attack on the wiring bottleneck by putting it to work for you. Promote it at every opportunity. Your customers (and you) need HOUSEPOWER to live (and sell) better . . . electrically!

For complete details on the HOUSEPOWER promotion, as well as other PCEA activities, contact either of our offices.

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